

# POPULAR SCIENCE

FOUNDED MONTHLY 1872

January  
**15¢**



SEE PAGE 123

**Hurricane! Six Pages of Color Photos**

Copyrighted material



**NEW! A LUXURY SHAVE  
...FAST AND CLEAN...**

**AT A LITTLE MORE THAN**

**1¢**

**A BLADE!**



**MARLIN-GUNMAKERS SINCE 1870 PRESENT-**

**Marlin**  
**HIGH-SPEED BLADES**

**SO INEXPENSIVE—You Can Afford the Luxury of a Fresh New Marlin Blade Every Morning—and yet—SO GOOD—Thousands Will Tell You that they Get More Fine Shaves Out of a Marlin Blade than Any Other Make!**

It's a real sensation—this new way of shaving. Instead of the old-fashioned scraping, nagging and hacking . . . once over and you have a clean, velvet-smooth, lightning-fast, perfect shave. That's because the new Marlin blade is made of fine Swedish surgical steel, the kind that will take a real "edge"—the kind that can be safely guaranteed by people who know steel—MARLIN, makers of fine guns for 67 years. Try Marlin's today. The big 20-blade package of double-edge blades costs only 25c, little more than a penny a blade. If you feel extravagant and want a real luxurious shave, use a fresh new Marlin Blade every morning. But don't forget. Thousands of men everywhere will tell you that you get more good shaves out of a Marlin Blade than any other blade made. Get them at any good store. **NOTE**—If your dealer hasn't yet received his supply, mail \$1 for 4 cartons (80 blades) or 50c for 40—or 25c for 20. 100% satisfaction guaranteed or send them back and get your money.



**20 for 25¢**

● **Single Edge Blades 15 for 25c**

**MAIL COUPON TODAY**  
**IF YOUR DEALER HASN'T GOT THEM**

Marlin Firearms Co., Dept. P-1, New Haven, Conn.  
Gentlemen: Enclosed find \$.....for.....Marlin  
Blades. I can return them if I don't like them.

Name.....

Street.....

City.....State.....

☐ Check here if you want single edge blades—15 for 25c, 30 for 50c,  
60 for \$1.00.

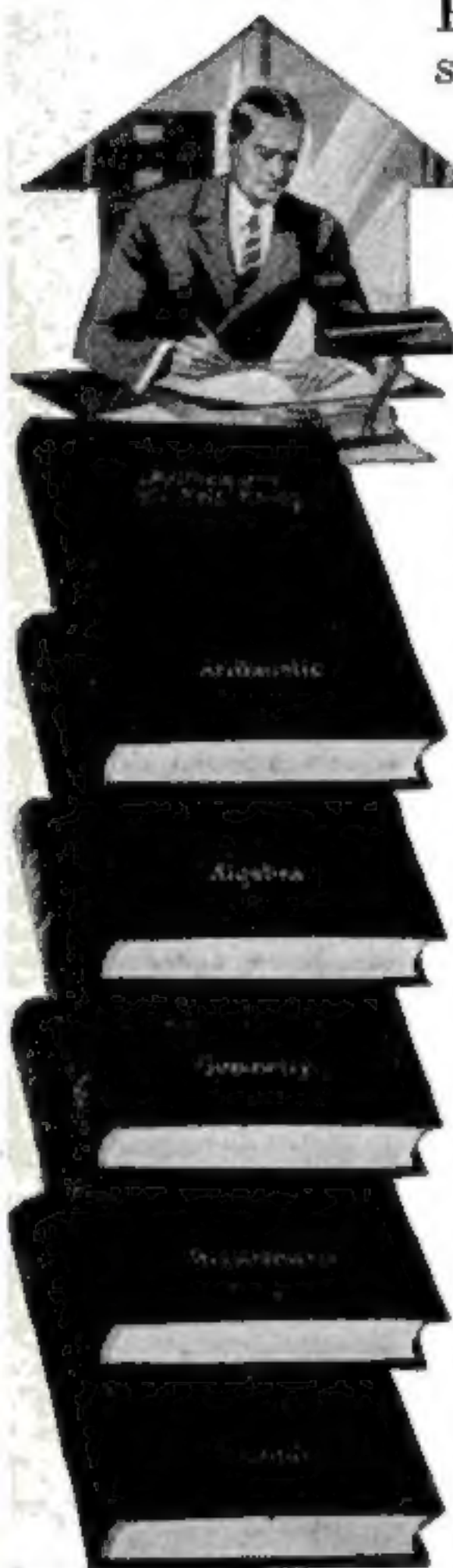
☐ Check here if you want a Marlin gun catalog.

**ONCE OVER AND A CLEAN SHAVE**



THIS COMPLETE, SIMPLE, PRACTICAL COURSE  
FOR SELF-INSTRUCTION WILL QUICKLY GIVE YOU

## A Complete Mastery of MATHEMATICS



### A Complete Course and Reference Library in 5 Volumes

Arithmetic  
Algebra  
Geometry  
Trigonometry  
Calculus

1598 Pages Illustrated

He presents each practical method and problem in the clearest, simplest way. He gets right down to the kind of information that you need in your daily work.

### Send No Money—Mail This Coupon for FREE EXAMINATION

D. Van Nostrand Co., Inc., 250 Fourth Ave., New York  
Send me MATHEMATICS FOR SELF-STUDY in 5 volumes.  
Within 10 days I will either return the books or send you \$2.95  
as first payment and \$2.00 per month for 3 months—total \$8.95  
(5% discount for cash). (P.S.M. 1-39)

Name .....

Address .....

City and State .....

Reference .....

Address .....

☐ FOR FREE CATALOG of best books of practical instruction and technical information, check here. If you do not want Mathematics for Self-Study cross out paragraph above.

Prepare now to advance yourself to an important job by *Mathematics Training*. *Mathematics* is the foundation of all mechanical and scientific work, and of all business or industry based on science. Without this essential knowledge even the most capable man is left behind while others forge ahead to better jobs, bigger contracts, more money. You need mathematics to solve technical problems and to improve, speed up and check on your work and the work of others.

Now you can learn mathematics by an easy, inexpensive and time-saving method. A very simple and extremely interesting course in book form has been prepared for you by an expert who has devoted a lifetime to teaching practical men the fundamentals of this important subject.

### MATHEMATICS FOR SELF-STUDY

By J. E. Thompson, B.S., A.M.,  
Dept. of Mathematics,  
Pratt Institute

These books start right from the beginning with a review of arithmetic that gives you all special short-cuts and trick methods that save countless hours of your time. Then they go right into higher mathematics and show you how simple it is when an expert explains it for you. In no time at all you will be tackling with ease the most difficult questions on this subject.

### An Expert's Simplified Methods

Mr. Thompson, the author of these books, has had many years' experience in mathematical training.

## EASY MAKE YOUR OWN FURNITURE



### THE GOOD ENGLISH CRAFTSMAN WAY!

How to make everything from bookends to bedsteads with simple tools clearly described in THE CARPENTRY BOOK by Charles H. Hayward, Associate Editor, "Woodworker" Magazine.

### WORKING DIAGRAMS AND LISTS OF MATERIALS NEEDED FOR MAKING 100 FINE USEFUL ARTICLES

Superior English methods of mortise and tenon, dovetailing, dowsing, panelling, door-hanging, veneering, upholstery, wood finishing made easy. 336 pages, nearly 600 diagrams including unusual tables, chairs, lamps, clock cabinets, trays, book troughs, kitchen cabinets, nursery furniture, garden furniture, garage, etc., etc. Nothing like it in the U.S.!

### SEND NO MONEY—EXAMINE IT 5 DAYS FREE!

Sent postpaid for 5 Days FREE EXAMINATION. Then return book or send \$2.50—10% discount for payment now (same return privilege).

D. VAN NOSTRAND CO., Dept. P.S.M.-1-39, 250-4th Ave., New York

### LIMITED EDITION—MAIL THIS COUPON NOW!

D. Van Nostrand Co., Dept. P.S.M.-1-39, 250-4th Ave., New York  
Send THE CARPENTRY BOOK postpaid on 5 Days FREE APPROVAL. I will either return it or send \$2.50 as full payment.

Name .....

Address .....

City .....

State .....

(10% discount for cash—send only \$2.25—same return privilege)

## NOW! THE ENTIRE FIELD OF PRACTICAL PHOTOGRAPHY

### IN ONE BIG VOLUME

For Amateur and Professional

The Most Complete, Up-to-

Date, Authoritative

Book of Its Kind

650 PAGES

225 illus-

trations

Finest work available on every phase of photography from purchase of camera, all stages of picture taking, developing and printing, to full-color photography—by C. B. Neblette, Head of Dept. of Photographic Technology, Rochester Athenaeum and Mechanics Institute, Rochester, N. Y.

### "PHOTOGRAPHY—Its Principles and Practice"—New Enlarged Edition

Full directions for exposure, developing, fixing, washing, drying, intensifying, reducing, printing, enlarging, mounting. Explains optics, emulsions, monochrome, sensitizing, filters, Kodachrome, 3-color photography, many unusual processes and effects. See coupon for free approval offer.

### FREE EXAMINATION!—Mail This Coupon Today

D. Van Nostrand Co., Inc., 250 Fourth Ave., N. Y.

Send "Photography, Its Principles and Practice," 650 pages, in handsome sturdy cloth. In 10 days I will return it or send \$6.50—\$2.50 as first payment and \$2.00 monthly for two months. (P.S.M. 1-39)

Name .....

Address .....

City & State .....

Reference .....

Address .....

☐ For free catalog of best books of practical instruction and technical information, check here. If you do not want Photography, Its Principles and Practice, cross out paragraph above.



# POPULAR SCIENCE

*Monthly*

Founded 1872

Volume 134, No. 1

RAYMOND J. BROWN, *Editor*

ARTHUR WAKELING, Home Workshop Editor

ALDEN P. ARMAGNAC, Associate Editor

GEORGE H. WALTZ, Jr., Associate Editor

SYDNEY OXBERRY, Art Editor

## CONTENTS FOR JANUARY 1939

|   |     |
|---|-----|
| Radio Altimeter Makes Flying Safer..... | 49  |
| Masked Men Train Dogs for Blind.....    | 56  |
| New Jobs for Radio Waves.....           | 60  |
| After a Hurricane.....                  | 65  |
| Hollywood's Phantom Navy.....           | 72  |
| Amazing Stop-Motion Photos.....         | 80  |
| Foiling the Gold-Mine Swindlers.....    | 84  |
| Floating Factory Aids Whalers.....      | 92  |
| Science Builds a Doll-House Bakery..... | 100 |
| He Makes Fire Engines from Junk.....    | 108 |
| Dollars from Smells.....                | 112 |
| Make-Believe Crimes Train Sleuths.....  | 118 |

### *Features and Departments*

|                                      |     |
|--------------------------------------|-----|
| OUR READERS SAY—.....                | 12  |
| NEW IDEAS FOR HOME OWNERS.....       | 40  |
| THE MAN WITH THE NET.....            | 105 |
| POPULAR SCIENCE QUESTION BEE.....    | 136 |
| UN-NATURAL HISTORY.....              | 137 |
| NEW HOUSEHOLD APPLIANCES.....        | 138 |
| GUS WILSON'S MODEL GARAGE.....       | 140 |
| AMATEUR PHOTOGRAPHY.....             | 152 |
| HOME-LABORATORY CHEMISTRY.....       | 192 |
| ADVENTURES WITH YOUR MICROSCOPE..... | 198 |
| RADIO DEPARTMENT.....                | 202 |
| USEFUL HINTS FOR MOTORISTS.....      | 208 |

### AUTOMOBILES

|                                      |     |
|--------------------------------------|-----|
| Camera Car Gets Dope on Speeders.... | 64  |
| Barrier Keeps Autos in Line.....     | 71  |
| Giraffes Ride in Odd Truck.....      | 77  |
| Automatic Cigarette Lighter.....     | 89  |
| Detects Carbon Monoxide.....         | 91  |
| Garage Oil Can Gets Headlight.....   | 102 |
| Big Farm Tractors Go Modern.....     | 122 |
| Exhaust Analyzer for Motorists.....  | 208 |
| Helping a Driver to Park.....        | 210 |
| Hose Grips Lens Holder.....          | 210 |
| Tire Pump Tests Brakes.....          | 212 |
| Nozzle Deflects Exhaust.....         | 212 |

### AVIATION

|                                      |     |
|--------------------------------------|-----|
| Airport Tests Cotton Runways.....    | 63  |
| Direction Finder Is Automatic.....   | 77  |
| Scout Plane Rides on Bomber's Back.. | 89  |
| Emergency Light for Air Raids.....   | 91  |
| Plane Drops Fish to Stock Lake.....  | 97  |
| Glider Launched from Balloon.....    | 125 |
| Static Suppressor for Planes.....    | 240 |

### HEALTH & HYGIENE

|                                    |     |
|------------------------------------|-----|
| Isolates Vitamin A Crystals.....   | 76  |
| Iron Lung Treats Four at Once..... | 99  |
| Shows How Radium Fights Cancer.... | 124 |
| Snake Venom Soothes Eyes.....      | 135 |

### HELPS FOR HOME OWNERS

|                                     |    |
|-------------------------------------|----|
| Clamps Help Make Sawhorses.....     | 40 |
| Airless Paint-Spray Gun.....        | 40 |
| Ingenious Striping Tool.....        | 40 |
| Electric Outlet Sticks on Wall..... | 40 |

(Continued on page 4)

## THE HOME WORKSHOP begins on page 143

Published monthly at 353 Fourth Avenue, New York, N. Y., by Popular Science Publishing Co., Inc. A. L. Cole, President and Treasurer; Godfrey Hammond, Executive Vice President; R. C. Wilson, Vice President; John Nichols, Vice President; C. D. Freeman, Vice President; F. W. Briggs, Secretary. Entered as second-class matter Dec. 28, 1918, at the Post Office at New York under the act of March 3, 1879; additional entry as second-class matter at Dayton, Ohio. Entered as second-class matter at the Post Office Department, Canada. Printed in U. S. A. Copyright, 1938, by Popular Science Publishing Co., Inc. All rights reserved in the United States, Great Britain, and in all countries participating in the International Copyright Convention and the Pan American Copyright Convention. Single copy, 15 cents. Yearly subscriptions to United States, its possessions, and Canada, \$1.50; foreign countries, excepting Canada, \$2. Subscribers must notify us of change of address four weeks in advance of the next publication date. Be sure to give both old and new address. The contents of this magazine must not be reprinted without permission. The editors are not responsible for unsolicited contributions, and cannot guarantee the return of such material or insure against its loss. Contributions not accompanied by sufficient postage will not be returned. In presenting numerous stories of new products of applied science, Popular Science Monthly does not underwrite the business methods of the individuals or concerns producing them. To avoid liability for patent infringement, readers should investigate before making, using, or offering for sale any of the devices, machines, or processes described; Popular Science Monthly takes no responsibility. The use of Popular Science Monthly articles for stock-selling schemes is never authorized.

POPULAR SCIENCE



# What will you be doing - ONE YEAR FROM TODAY



• Three hundred and sixty-five days from now — where will you be?

Still be struggling along in the same old job at the same old salary — worried about the future — never able to make both ends meet? Will you still be putting off your start to success—fiddling away precious hours that will never come again?

Don't do it, man—don't do it! There's no greater tragedy than that of the man who stays sunk in a rut all his life, when with just a little effort he could advance.

Think of the thousands of successful, prosperous men in every industry and business who owe much of their success to International Correspondence Schools training (you'd recognize hundreds of their names). They *refused* to be licked by lack of training! They found that the I. C. S. offered them comprehensive yet simplified texts prepared by outstanding authorities, plus personal guidance and expert, understanding instruction.

The coupon will bring you the full story of the I. C. S., and what it can mean to you.

## INTERNATIONAL CORRESPONDENCE SCHOOLS

BOX 7649-J, SCRANTON, PENNA.

★ Without cost or obligation, please send me a copy of your booklet, "Who Wins and Why," and full particulars about the subject *before* which I have marked X: ★

### TECHNICAL AND INDUSTRIAL COURSES

- |  |  |  |   |
|--|--|--|---|
| <input type="checkbox"/> Architect                 | <input type="checkbox"/> Sheet Metal Worker                            | <input type="checkbox"/> Commercial Refrigeration                            | <input type="checkbox"/> Surveying and Mapping                              |
| <input type="checkbox"/> Architectural Draftsman   | <input type="checkbox"/> Boilermaker                                   | <input type="checkbox"/> Plumbing <input type="checkbox"/> Steam Fitting     | <input type="checkbox"/> Bridge Engineer                                    |
| <input type="checkbox"/> Building Estimating       | <input type="checkbox"/> Telegraph Engineer                            | <input type="checkbox"/> Heating <input type="checkbox"/> Ventilation        | <input type="checkbox"/> Bridge and Building Foreman                        |
| <input type="checkbox"/> Contractor and Builder    | <input type="checkbox"/> Telephone Work <input type="checkbox"/> Radio | <input type="checkbox"/> Air Conditioning and Cooling                        | <input type="checkbox"/> Chemistry <input type="checkbox"/> Pharmacy        |
| <input type="checkbox"/> Structural Draftsman      | <input type="checkbox"/> Mechanical Engineering                        | <input type="checkbox"/> Steam Engineer                                      | <input type="checkbox"/> Coal Mining  |
| <input type="checkbox"/> Structural Engineer       | <input type="checkbox"/> Mechanical Draftsman                          | <input type="checkbox"/> Steam Electric Engineer                             | <input type="checkbox"/> Mine Foreman <input type="checkbox"/> Fire Boilers |
| <input type="checkbox"/> Management of Inventions  | <input type="checkbox"/> Machinist <input type="checkbox"/> Toolmaker  | <input type="checkbox"/> Marine Engineer                                     | <input type="checkbox"/> Navigation   |
| <input type="checkbox"/> Electrical Engineer       | <input type="checkbox"/> Patternmaker                                  | <input type="checkbox"/> R. R. Locomotives                                   | <input type="checkbox"/> Cotton Manufacturing                               |
| <input type="checkbox"/> Electric Lighting         | <input type="checkbox"/> Diesel Engines                                | <input type="checkbox"/> R. R. Section Foreman                               | <input type="checkbox"/> Woolen Manufacturing                               |
| <input type="checkbox"/> Welding, Electric and Gas | <input type="checkbox"/> Aviation Engines                              | <input type="checkbox"/> Air Brakes <input type="checkbox"/> R. R. Signalmen | <input type="checkbox"/> Agriculture  |
| <input type="checkbox"/> Reading Shop Blueprints   | <input type="checkbox"/> Auto Technician                               | <input type="checkbox"/> Highway Engineering                                 | <input type="checkbox"/> Fruit Growing                                      |
| <input type="checkbox"/> Heat Treatment of Metals  | <input type="checkbox"/> Auto Electrical Technician                    | <input type="checkbox"/> Civil Engineering                                   | <input type="checkbox"/> Poultry Farming                                    |

### BUSINESS TRAINING COURSES

- |  |   |  |  |
|--|---|--|--|
| <input type="checkbox"/> Business Management   | <input type="checkbox"/> Bookkeeping      | <input type="checkbox"/> Service Station Salesmanship                        | <input type="checkbox"/> Grade School Subjects                               |
| <input type="checkbox"/> Industrial Management | <input type="checkbox"/> Secretarial Work | <input type="checkbox"/> First Year College Subjects                         | <input type="checkbox"/> High School Subjects                                |
| <input type="checkbox"/> Traffic Management    | <input type="checkbox"/> Spanish          | <input type="checkbox"/> Business Correspondence                             | <input type="checkbox"/> College Preparatory                                 |
| <input type="checkbox"/> Accountancy           | <input type="checkbox"/> French           | <input type="checkbox"/> Stenography and Typing                              | <input type="checkbox"/> Illustrating  |
| <input type="checkbox"/> Cost Accountant       | <input type="checkbox"/> Salesmanship     | <input type="checkbox"/> Civil Service <input type="checkbox"/> Mail Carrier | <input type="checkbox"/> Cartooning  |
| <input type="checkbox"/> C. P. Accountant      | <input type="checkbox"/> Advertising      | <input type="checkbox"/> Railway Mail Clerk                                  | <input type="checkbox"/> Lettering Show Cards <input type="checkbox"/> Signs |

### DOMESTIC SCIENCE COURSES

- |   |   |  |
|---|---|--|
| <input type="checkbox"/> Home Dressmaking                       | <input type="checkbox"/> Advanced Dressmaking | <input type="checkbox"/> Foods and Cookery                           |
| <input type="checkbox"/> Professional Dressmaking and Designing |   | <input type="checkbox"/> Tea Room and Cafeteria Management, Catering |

Name.....Age.....Address.....

City.....State.....Present Position.....

If you reside in Canada, send this coupon to the International Correspondence Schools Canadian, Limited, Montreal, Canada  
If you reside in England, send coupon to I. C. S., 71 Kingsway, London, W. O. 2, England



|                                  |    |
|----------------------------------|----|
| Keeps Windows from Rattling..... | 42 |
| Tells When Fuse Is Blown.....    | 42 |

## HOUSEHOLD AIDS

|                                    |     |
|------------------------------------|-----|
| Wall Rack for Kitchen Tools.....   | 138 |
| Mixer Has Five-Quart Capacity..... | 138 |
| Merry-Go-Round Tray.....           | 138 |
| Server Keeps Food Fresh.....       | 138 |
| Table Warming Oven.....            | 139 |
| Coffeepot Has Overcoat.....        | 139 |
| Toy Boat Tests Warmth of Bath..... | 139 |
| Device Heats Baby's Food.....      | 139 |

## NEW INVENTIONS

|                                       |     |
|---------------------------------------|-----|
| With the Inventors.....               | 22  |
| Shaving Soap in Celluloid Tube.....   | 52  |
| Easy-To-Work Anchor Reel.....         | 53  |
| Transparent Mail Box.....             | 71  |
| Automatic Rifle Has Odd Design.....   | 78  |
| Hand Loom Speeds Up Knitting.....     | 78  |
| Oyster Boat Is Giant Vacuum Cleaner   | 79  |
| Novel Windows Give Light Control....  | 89  |
| Ink-Bottle Stopper Fills Pens.....    | 90  |
| Illuminated Lens Fits Power Tools.... | 90  |
| Set-Up Scenic Post Cards.....         | 91  |
| Spring Holds Ties on Handy Rack.....  | 97  |
| Meter Tells When Walls Are Dry.....   | 97  |
| New Air-Defense Gun Gets Test.....    | 98  |
| Eye Pads Are New Beauty Aids.....     | 98  |
| Chart Helps Child Learn To Write..... | 98  |
| Branding Gun Replaces Iron.....       | 99  |
| Brush Holds Spot-Removing Liquid....  | 102 |
| "Hot Dogs" Peel Like Bananas.....     | 103 |
| Trolley-Wire Guard Protects Miners..  | 103 |
| Kit Holds Electric-Razor Parts.....   | 103 |
| Watch Strap Fits Any Wrist.....       | 104 |
| Machine Types, Sets Type, at Once.... | 104 |
| Beauty-Shop Head Shade.....           | 105 |
| Edger Protects Paper.....             | 105 |
| Headlight Fits Electric Razor.....    | 107 |
| Visible Index on Atlas.....           | 117 |
| Desk Phone Has Pull-Out Dial.....     | 122 |
| Electric Brain Gives Formulas.....    | 123 |
| Speedy New Rig for Ice Boats.....     | 123 |
| Humidifier Fits Cigarette Pack.....   | 125 |
| Combination Kit for Travelers.....    | 127 |
| New Piano Has No Sound Board.....     | 130 |
| Buttons Eject Keys from Case.....     | 131 |
| New Atomizer Is Unbreakable.....      | 131 |
| Squeeze Tube Puts Out Fires.....      | 132 |
| Net on Paddle in New Ball Game.....   | 132 |
| Resin Coat Makes Paper Washable....   | 132 |
| Rings on Telephone Dial.....          | 133 |
| Rack Holds Electric Razor.....        | 133 |
| Permanent Ink Writes on Glass.....    | 133 |
| "Fertility Meter" Analyzes Soil.....  | 133 |
| Ice Creepers Fit Any Shoe.....        | 134 |
| Pocket Pencil Sharpener.....          | 134 |
| Chart Turns Music into Colors.....    | 134 |
| New Magazine Powder Puff.....         | 135 |
| Violet Rays Replace Rouge.....        | 135 |
| Bubbles Filmed in Slow Motion.....    | 234 |

## PHOTOGRAPHY

|  |     |
|--|-----|
| Movie Camera Has Novel View Finder     | 55  |
| Flash Bulb on Hat Leaves Hands Free    | 125 |
| Mobile Crane Aids Movie Makers.....    | 126 |
| Make-Up Kit for Portrait Sitters.....  | 128 |
| Exposure Meter for Enlarging.....      | 128 |
| Frames Aid Slide Makers.....           | 128 |
| Marks Negatives for Enlargement.....   | 129 |
| Daylight Loader for Bulk Film.....     | 129 |
| Adapter for Small-Size Color Film..... | 129 |
| Printing Uncut Film in Frame.....      | 152 |
| Watch Hung Outside Darkroom.....       | 152 |
| File Tang Pries Up Can Lids.....       | 152 |
| Mirror Aids In Centering Film.....     | 152 |
| Flat Prints from Ferrottype Tin.....   | 153 |
| Tilt Top Improved with Felt.....       | 153 |
| Chemicals Measured with Spoons.....    | 153 |
| Luminous Dial Aids Night Shots.....    | 153 |
| Safe Light for Darkroom.....           | 154 |
| Reading Glass Used for Copying.....    | 155 |

## UNUSUAL FACTS & IDEAS

|                                       |     |
|---------------------------------------|-----|
| Back-Yard Merry-Go-Round.....         | 52  |
| Town Moved 180 Miles on Barges.....   | 52  |
| Rubber Nails for Pranksters.....      | 53  |
| Register To Count Fair Visitors.....  | 53  |
| Graveyard for Freight Cars.....       | 54  |
| "Rocket" Tank Fills Toy Balloons..... | 55  |
| How Navy Ships Are Named.....         | 58  |
| Stove and Radio in Bike Trailer.....  | 59  |
| Clock Has Ninety-Three Dials.....     | 62  |
| Buys Ten Tons of Blarney Stone.....   | 62  |
| Make-Up "Stocking" Can't Run.....     | 63  |
| Family "Bicycle" Carries Nine.....    | 64  |
| Microphone Headgear Aids Teacher....  | 71  |
| Take Census of Spawning Fish.....     | 78  |
| Pole-Climbing Pup Helps Lineman.....  | 90  |
| Workshop in Trunk Aids Magician....   | 96  |
| Smokes Liquid-Air Cigar.....          | 102 |
| Why Do Cats Land on Their Feet?....   | 106 |
| House Floated into Place.....         | 107 |
| Instruments Tested in Cleaned Air.... | 107 |
| Realistic Mechanical Horse.....       | 117 |
| Bicycle Drives Gas Pump.....          | 122 |
| Mower Is Mobile Radio Studio.....     | 131 |
| Indoor Man-of-War Trains Sailors..... | 135 |

## CRAFTWORK

|                                      |     |
|--------------------------------------|-----|
| Chain Lamp and Smoking Stand.....    | 149 |
| Amusing Cat-Tail Novelties.....      | 161 |
| Holder for Paper Napkins.....        | 165 |
| Jig-Sawed Signs Warn of Dog.....     | 167 |
| Clinkers Form Miniature Garden.....  | 170 |
| Marble Game with Spiral Track.....   | 171 |
| Pottery Hardens Without Baking.....  | 184 |
| Wire Cannibals Guard Cigarettes..... | 191 |

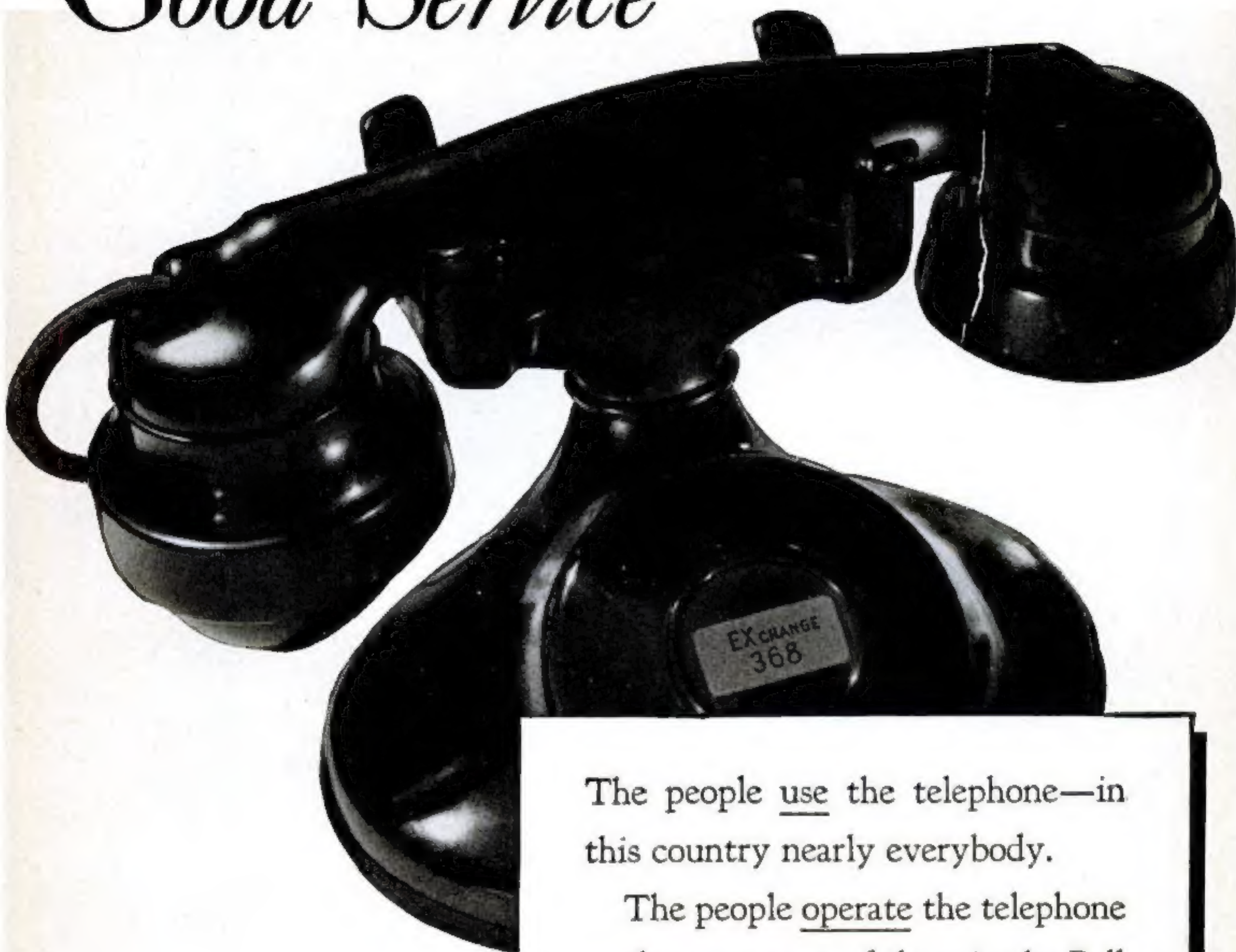
## MODELS

|                                    |     |
|------------------------------------|-----|
| Carvings Cure Homesickness.....    | 104 |
| Lining Up Ship Model Deadeyes..... | 149 |
| Whittled Harpers Ferry Gun.....    | 156 |

(Continued on page 6)



# *Yours for Good Service*



The people use the telephone—in this country nearly everybody.

The people operate the telephone—about 300,000 of them in the Bell System.

The people own the telephone business. There are about 750,000 owners of Bell System securities.

All of this works together to give you the best telephone service in the world at the lowest possible cost.

**BELL TELEPHONE  
SYSTEM**





# CONTENTS [Continued]

|                                      |     |
|--------------------------------------|-----|
| United States Superdreadnoughts..... | 176 |
| Two-Rail Operation for Railways..... | 182 |
| Straps for Ship-Model Blocks.....    | 242 |
| Working to a Different Scale.....    | 244 |
| Miniature Universal Coupling.....    | 245 |

## SHOP DATA FILE

|                                      |     |
|--------------------------------------|-----|
| Nail Sizes; Number to a Pound.....   | 166 |
| Testing a Vacuum Cleaner.....        | 171 |
| Construction of a Drawer.....        | 175 |
| Finishing Red Cedar Chests.....      | 180 |
| Refinishing Chests Not of Cedar..... | 181 |

## HINTS FOR THE HANDY MAN

|                                       |     |
|---------------------------------------|-----|
| Better Ways to Build Scenery.....     | 144 |
| Pulling Nails from Moldings.....      | 148 |
| Fastening Basement Windows.....       | 157 |
| Support for Food Grinder.....         | 157 |
| Coal Bin Extended Under Porch.....    | 158 |
| Speedy Sled for Snow or Ice.....      | 159 |
| Photo Mailing Cost Reduced.....       | 161 |
| Eraser Used as Sandpaper Block.....   | 161 |
| Paste Seals Bicycle-Tire Leaks.....   | 165 |
| Grooved Pump Spout Holds Pail.....    | 166 |
| Pipe Cleaner Used as a Wick.....      | 168 |
| How to Stop Refrigerator Noise.....   | 168 |
| Roofs Repaired for Little Cost.....   | 168 |
| News of Homeworkshop Guild.....       | 173 |
| Old Motor Winds Up Clothesline.....   | 175 |
| Paraffin Protects Garbage Can.....    | 179 |
| Ways to Finish Cedar Chests.....      | 180 |
| Old Toothbrush Cleans Combs.....      | 184 |
| Home Workshop Index for 1938.....     | 184 |
| Handy Tin-Can Pot for Glue.....       | 186 |
| Driving Small Nails into Plaster..... | 186 |
| Flash Light Held by Collar.....       | 189 |
| Water-Tight Corner Joints.....        | 191 |
| Old Bill Says—.....                   | 229 |

## NEW SHOP IDEAS

|                                      |     |
|--------------------------------------|-----|
| Motor Started Without Load.....      | 148 |
| Solder and Paste Kept Together.....  | 158 |
| Vise-Handle Notches Remove Dirt..... | 161 |
| Nonslip Dressing for Belts.....      | 165 |
| Aid for Drawing Perspectives.....    | 166 |

|                                    |     |
|------------------------------------|-----|
| Ink Holder Clamps on Board.....    | 167 |
| Tool-Post Grinding Attachment..... | 167 |
| Movable Benches Save Space.....    | 179 |
| Sandpaper Kept in Letter File..... | 179 |
| Efficient Air Compressor.....      | 185 |
| Drawers Have Slanting Sides.....   | 186 |
| Bending Light Sheet Metal.....     | 186 |
| Lead "Ducks" for Draftsmen.....    | 187 |
| V-Notch in Vise Aids Filing.....   | 187 |
| Easy Way to Drill Thin Metal.....  | 187 |
| Jack Adjusts Drill-Press Head..... | 189 |
| Accurate Work with Worn Chuck..... | 189 |
| Clamp for Sharpening Skates.....   | 190 |
| Tool for Drawing Draft Lines.....  | 190 |
| Improvised Clamps for Cables.....  | 241 |
| Wrench Holds Slipping Pulley.....  | 243 |

## RADIO

|                                     |     |
|-------------------------------------|-----|
| Handy Regulator for Amplifiers..... | 202 |
| Floor Lamp Has Built-In Radio.....  | 202 |
| Plug-In Control Tunes Receiver..... | 202 |
| Clock-Radio Does Triple Duty.....   | 203 |
| Sectional Masts for Amateurs.....   | 203 |
| Compact Chart Tells World Time..... | 203 |
| Lazy-Man's Tuner Fits Any Set.....  | 204 |
| Radio "Winks" When It is Tuned..... | 207 |

## WOODWORKING

|                                   |     |
|-----------------------------------|-----|
| Plans for a Pegged-Joint Bed..... | 150 |
| Ceiling Cabinets for Tools.....   | 158 |
| Cutting Dovetail Joints.....      | 162 |
| Cabinet Holds Serving Trays.....  | 168 |
| Foot Rest and Magazine Rack.....  | 170 |
| Sycamore Chest Holds Tools.....   | 188 |

## HOME LABORATORY

|                                      |     |
|--------------------------------------|-----|
| Device Grinds Telescope Mirrors..... | 169 |
| Chemistry Experiments with Gas.....  | 192 |
| Disappearing Laboratory Stand.....   | 195 |
| Ball Balances on Air Current.....    | 196 |
| Spinning Egg Stands Up on End.....   | 196 |
| Test Shows Candle Is Gas Plant.....  | 196 |
| Decreasing Moment of Inertia.....    | 197 |
| Invisible Vapor Tips Balance.....    | 197 |
| Lenses Reveal Marvels in Foods.....  | 198 |



arriving next month . . .

## A NEW CABIN CRUISER

A SERIES of articles describing how you can build this *de luxe* 17' cabin cruiser will begin in the February issue. The boat is powered by any small outboard or inboard motor up to 10 h.p. and is so economical that you and your friends can cruise all day on a dollar's worth of gas and oil. It has such a shallow draft that water only a foot deep can be navigated. Cost of construction ranges between \$75 and \$100.



# WHICH OF THESE MEN IS YOU?



Is This You?

OR

Is This You?



1. "My name is Stark. I'm never late mornings. I get back promptly from lunch—often work overtime cheerfully. I carefully do every single job they give me and in six years I have done each job so many times that I'm letter-perfect! Only one little raise so far, but some day I ought to get a good one. I'm probably the steadiest, most loyal employee in the whole office. One of these days the boss will realize that I'm the best man who ever worked on this job. Then I'll show these other fellows a thing or two!"

2. "My name is Baker. I've only been here a year, but the jobs they give men like Stark and me are too easy. In three months I saw I could never get far ahead on routine work like this. So I began to look for ways to increase and improve the work in my department. I'm taking home-study training that's helping me a lot. My boss heard about it and complimented me. Next month I'm going to be made Assistant Department Head at 40% more money. After that—well, we'll see. But you can bet I'm still studying!"

**D**ON'T you recognize both these men in your office? One is a slow plodder—the other an energetic go-getter. Stark thinks of himself—Baker, of his company. Stark runs along comfortably in a rut—*hopes* for a big raise. Baker pulls himself out of ruts—*gets* a big raise. And goes right on training for *another* one! It's men like Baker who turn to LaSalle business training because of what it *gets* them! And they know it gets them *plenty* because the proof is plain to read in the grateful letters—and the successful lives—of thousands of LaSalle graduates. You too can join the ranks of the "comers" like Baker if you'll "train on the

job you've got—to get the job ahead!" It all depends on you—the height of your ambition and your readiness to investigate, then study systematically and seriously. The LaSalle Success Road is cleared and ready for earnest adults—has been traveled for thirty years. Its first sign-post has always been a man's name on a coupon like the one below. It costs absolutely nothing to send such a coupon. But sending it may mean the turning-point in your whole life. Mail it! At least *find out* about LaSalle's road to better jobs—more money—success! There's no time like *NOW*!

**LASALLE EXTENSION UNIVERSITY, A Correspondence Institution**  
Dept. 183-R, CHICAGO

I am ambitious like Baker. Tell me how I can prepare for larger success—and send me your free booklet on the field I have checked below:

|   |   |                                       |
|---|---|---------------------------------------|
| <input type="checkbox"/> Executive Management | <input type="checkbox"/> Law: LL.B. Degree  | <input type="checkbox"/> Salesmanship |
| <input type="checkbox"/> Accounting           | <input type="checkbox"/> Traffic Management |                                       |

Name \_\_\_\_\_ Age \_\_\_\_\_

Position \_\_\_\_\_

Address \_\_\_\_\_



**LaSalle** EXTENSION UNIVERSITY  
A CORRESPONDENCE INSTITUTION





**CHARLES ATLAS**  
*"The World's Most Perfectly Developed Man"*

# If You Had Only 10 Days to Live

Suppose doctors said you had only ten days more to live! What would you give to have another ten YEARS of life? "Anything in the world!" you would say. Unfortunately, it would be too late. NOW, while you have many years more to live, is the time to fortify yourself against later troubles.

## CONSTIPATION— The Plague of the World

Constipation is so common many people do not realize its serious results. If city sewers did not drain out daily, disease would break out everywhere! That begins to happen in your system if chronically constipated. Yet to end Constipation is not difficult if you have no organic ailment.

### Nine Out of Ten People Can Be Relieved

I have helped relieve nine out of ten of my clients. My method tones up your entire system. I give life to little-used muscles that in later years would begin to shrivel up. I do not believe in weights, springs or other old-fashioned, dangerous methods. My system of Dynamic Tension is natural, effective. Results are guaranteed.

## Get My Free Book

I would like to send you my book telling how I have helped over 90,000 people. Some were run-down, nervous, constipated. I showed them how to be able to enjoy life's pleasures. They felt the surge of new vigor. Their new health and strength resists disease. They have added years to their lives. They say "I now feel like a NEW MAN."

Just mail the coupon and I shall send you a copy of my book, "EVERLASTING HEALTH AND STRENGTH." This places you under no obligation. **CHARLES ATLAS, Dept. 1-A, 115 East 23rd Street, New York, N. Y.**



**CHARLES ATLAS, Dept. 1-A,  
 115 East 23rd Street, New York, N. Y.**

Please send me, without obligation, your FREE book, "Everlasting Health and Strength"—and full details of your 7-DAY TRIAL OFFER.

Name .....

Address .....

City ..... State .....

## Learn AIRPLANE DESIGNING

Train at home for a position in this vital branch of aviation with specialized courses prepared by leading Engineers now employed by major aircraft factories. Step out of the jack-of-all-trades class. Specialized Aero Drafting, Layout and Design lead to ranking Engineers positions. You can start this training without previous experience, and only simple arithmetic is required. Other advanced courses in Stress Analysis and Electrical Engineering. Check and mail this advertisement today for free booklet, "Specialized Application Brings Greater Success."

S-1



**WESTWOOD**  
*Correspondence School*  
 VILLAGE STATION  
 LOS ANGELES, CALIFORNIA

☐ Aero Drafting ☐ Designing ☐ Stress Analysis ☐ Electrical Engineering

## EARN A DEGREE AT HOME

Home Study Courses leading to Degrees in Arts; Sciences; Philosophy; Education; Public Health; Psychology; Sociology; Physics; Chemistry; Geology; Pol. Science; Theology; Law; Agriculture; Business Training; Accounting; Statistics; Adv.; Sales; Electrical, Civil, Mechanical, Drafting, Architectural, Automotive, Steam, Diesel, Aeronautical, Radio, Structural, Mining, Industrial, Highway, Petroleum, Marine, Refrigeration, Air Conditioning, Chemical Engineering. Founded 1908. **McKinley-Roosevelt Graduate College, 4211 Clarendon Ave., Chicago**



## TRI-STATE COLLEGE B-S-Degree in 2 years

World famous for technical 2-year courses in Civil, Electrical, Mechanical, Chemical, Radio, Aeronautical Engineering, Business Administration and Accounting. Those who lack high school may make up work. Short diploma courses (36 weeks) in Surveying, Drafting. Low tuition. Low living costs. Students from every state and many foreign countries. 55th year. Enter January, March, June, September. Write for catalog. 519 College Ave., ANGOLA, IND.

## TRIAL LESSON IN Free • DRAFTING



More good jobs now in Drafting. Learn AT HOME in spare time (or at our Chicago School). Send post card for FREE TRIAL LESSON and see how easy to learn and get a good job.

**CHICAGO TECHNICAL COLLEGE**  
 A-216 Tech. Bldg., 118 E. 26th St., Chicago, Ill.

## AVIATION



**APPRENTICES**  
**GOOD PAY** **GOOD FUTURE**  
 AIRMINDED YOUNG MEN INTERESTED IN TRAINING FOR ENTERING THE WELL PAID FIELD OF AVIATION AS APPRENTICES—Write immediately, enclosing stamp.  
**MECHANIX UNIVERSAL AVIATION SERVICE CO.**

Wayne County Airport Box 857 Dept. H Detroit, Michigan

## Train for a Well-Paid Hotel Position



Good positions for trained men and women in hotel, club, restaurant and institutional field. Previous experience proved unnecessary. Qualify in **FOUR MONTHS**—learn on real hotel equipment, under expert instructors. National Placement Service FREE of extra charge. New Day Classes start Jan., Feb., Sept., Oct. Catalog FREE!  
**LEWIS HOTEL TRAINING SCHOOLS**  
 Division RTA-2734 Washington, D. C.



# You Ask Me What I Am Doing?



## I Am Getting Ready to Earn More Money ... Preparing for a Bigger Job

I am a student of the American School, Chicago. A little more than half way through my course—already my increased knowledge has brought me promotion as a result of the hour or so a day I have been spending getting acquainted with the principles of the work I enjoy. I use only part of my spare time, so it doesn't interfere with my home and social life, and certainly helps me on the job.

I have been surprised at the practical manner in which even advanced work is explained. It is a lot easier than I had expected. I only wish I had started this plan of getting ahead a few years earlier. But when I was 18 to 20 I felt pretty sure of myself. I didn't take enough stock in what more experienced people told me about the importance of being thoroughly trained for the job I wanted.

### You Can't Win If You Don't Try

American School, Dept. G146, Drexel Ave. at 58th St., Chicago

CUT ALONG THIS LINE

### Try a Lesson Yourself—No Obligation

American School, Dept. G146, Drexel Ave. at 58th St., Chicago

I have checked the line of work in which I would like a good job. Please send me without expense or obligation on my part a copy of your Bulletin and an early lesson in the field I have selected.

- ☐ Air Conditioning
- ☐ Architecture
- ☐ Automotive Engineering
- ☐ Automobile Repairing
- ☐ Bookkeeping and Cost Accounting
- ☐ Business Management
- ☐ Civil Engineering
- ☐ Aviation
- ☐ Contracting, Building

- ☐ Electrical Engineering
- ☐ Diesel Engineering
- ☐ Drafting and Designing
- ☐ Electric Refrigeration
- ☐ Heating, Ventilating, Plumbing
- ☐ Professional Accounting
- ☐ Incl. C. P. A. Coaching
- ☐ High School
- ☐ Highway Engineering

- ☐ Law
- ☐ Liberal Arts (College)
- ☐ Mechanical Engineering
- ☐ Merchandising
- ☐ Private Secretary
- ☐ Radio and Television
- ☐ Salesmanship
- ☐ Shop Practice
- ☐ Steam Engineering



Name \_\_\_\_\_ Age \_\_\_\_\_ Occupation \_\_\_\_\_

Street \_\_\_\_\_ City \_\_\_\_\_ State \_\_\_\_\_



# HOW A "TIP" GOT TOM A GOOD JOB

I HAVEN'T HAD A RAISE IN YEARS -- GUESS I NEVER WILL -- I'M READY TO GIVE UP

BUCK UP, TOM, WHY NOT TRY AN INDUSTRY THAT'S GROWING -- WHERE THERE'S MORE OPPORTUNITY

5 I'M DOING SWELL IN RADIO. MARY AND I ARE TO BE MARRIED NEXT MONTH. RADIO IS A BIG BUSINESS AND GROWING FAST. TAKE MY TIP AND GET INTO RADIO NOW, TOM!

6 IF BILL SUCCEEDED I CAN TOO!

THEN I CAN MAKE REAL MONEY SERVICING RADIO SETS

OR GET A JOB IN A BROADCASTING STATION

OR INSTALL AND SERVICE LOUD SPEAKER SYSTEMS



J. E. Smith, President, National Radio Institute Established 1914

He has directed the home study training of more men for the Radio Industry than any other man in America.

## I will train YOU too at Home in Spare Time for Good Jobs in Radio

### HERE'S PROOF THAT MY TRAINING PAYS



#### \$50 Monthly in Spare Time

"I work on Radio part time, still holding my regular job. Since enrolling seven years ago I have averaged around \$50 every month." JOHN B. MORISSETTE, 809 Valley Street, Manchester, N. H.

#### Makes \$50 to \$60 a Week

"I am making between \$50 and \$60 a week after all expenses are paid and I am getting all the Radio work I can take care of, thanks to N. R. I." H. W. SPANGLER, 126 1/2 S. Gay St., Knoxville, Tenn.



#### Operates Public Address System

"I have a position with the Los Angeles Civil Service, operating the Public Address System in the City Hall Council. My salary is \$170 a month." R. H. ROAD, R. 136, City Hall, Los Angeles, Calif.

Radio offers you many opportunities for well-paying spare time and full time jobs. You don't have to give up your present job, leave home or spend a lot of money to become a Radio Expert. I'm so sure I can train you at home for a good Radio job that I agree in writing to refund every penny you pay me if you are not satisfied with my training when you finish

#### Get Ready Now for Jobs Like These

Radio broadcasting stations employ engineers, operators, station managers and pay up to \$5,000 a year. Fixing Radio sets in spare time pays many \$200 to \$500 a year—full time jobs with Radio jobbers, manufacturers and dealers as much as \$30, \$50, \$75 a week. Many Radio Experts open full or part time Radio sales and repair businesses. Radio manufacturers and jobbers employ testers, inspectors, foremen, engineers, servicemen, and pay up to \$6,000 a year. Automobile, police, aviation, commercial Radio, loud speaker systems are newer fields offering good opportunities now and for the future. Television promises to open many good jobs soon. Men I trained have good jobs in these branches of Radio. Read how they got their jobs. Mail coupon.

#### Why Many Radio Experts Make \$30, \$50, \$75 a Week

Radio is young—yet it's one of our large industries. More than 28,000,000 homes have one or more Radios. There are more Radios than telephones. Every year millions of Radios get out of date and are replaced. Millions more need new tubes, repairs. Over \$50,000,000 are spent every year for Radio repairs alone. Over 5,000,000 auto Radios are in use; more are being sold every day offering more profit-making opportunities for Radio experts. And RADIO IS STILL YOUNG, GROWING, expanding into new fields. The few hundred \$30, \$50, \$75 a week jobs of 20 years ago have grown to thousands. Yes, Radio offers opportunities—now and for the future!

### Get Facts about THE TESTED





### Many Make \$5, \$10, \$15 a Week Extra in Spare Time While Learning

The day you enroll, in addition to our regular Course, I start sending Extra Money Job Sheets, show you how to do Radio repair jobs. Throughout your training I send plans and directions that made good spare time money—\$200 to \$500—for hundreds, while learning. I send you special Radio equipment to conduct experiments, build circuits. This 50-50 method of training makes learning at home easy, fascinating, practical.

### I Also Give You This Professional Servicing Instrument

Here is the instrument every Radio expert needs and wants—an All-Wave, All-Purpose, Set Servicing Instrument. It contains everything necessary to measure A.C. and D.C. voltages



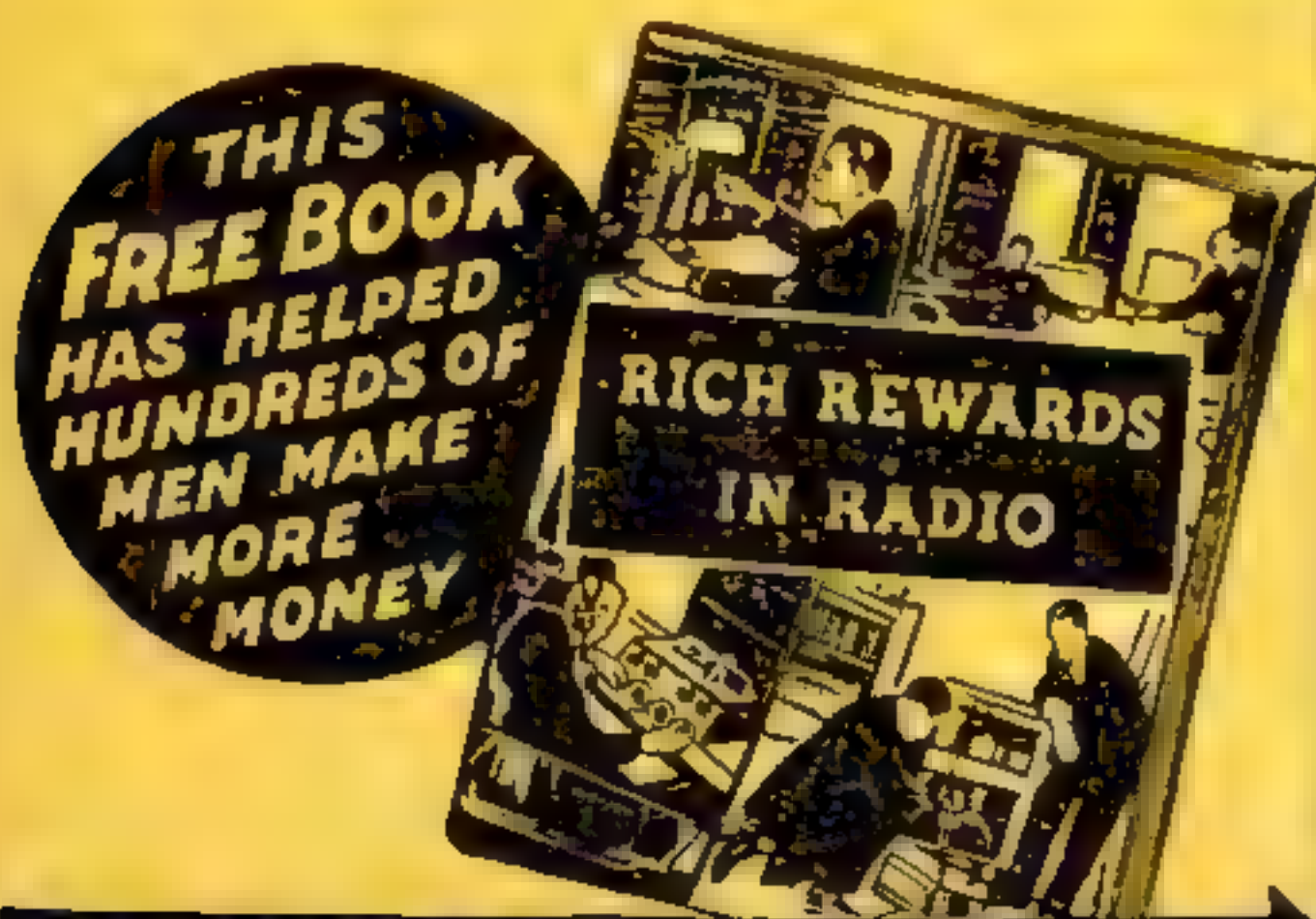
and current; to test tubes; resistance; adjust and align any set, old or new. It satisfies your needs for professional servicing after you graduate—can help you make extra money fixing sets while training.

### Find Out What Radio Offers You

Act Today. Mail the coupon now for "Rich Rewards in Radio." It's free to any fellow over 16 years old. It points out Radio's spare time and full time opportunities and those coming in Television; tells about my training in Radio and Television; shows you letters from men I trained, telling what they are doing and earning. Find out what Radio offers YOU! MAIL COUPON in an envelope, or paste on a postcard—NOW!

J. E. SMITH, President  
Dept. 9AP3  
National Radio Institute  
Washington, D. C.

GET THE FACTS.  
MAIL THIS COUPON  
NOW!



**This Coupon is Good For One FREE Copy of My Book**

J. E. SMITH, President, Dept. 9AP3,  
National Radio Institute, Washington, D. C.

Dear Mr. Smith: Without obligating me, send "Rich Rewards in Radio," which points out the spare time and full time opportunities in Radio and explains your 50-50 method of training men at home in spare time to become Radio Experts. (Please Write Plainly.)

NAME ..... AGE .....

ADDRESS .....

CITY ..... STATE .....

**WAY TO BETTER PAY**



# Our Readers Say



## Henry Saw the Light, but Failed To Smell a Rat

HAVING read in "Our Readers Say" of several ways of disposing of rats—which didn't help me out a bit—I want to stick in my two-bits' worth. I had a rat until yesterday. In fact, I

have been host to this beastie for the better part of a year, and have tried everything under the sun but poison to get rid of it. We called our rat Henry. He was prankish and very canny. He had practically become one of the family. Now Henry has passed on, and I come to the point of this rat tale. It was Sherlock Holmes, I believe, who

said "It's like using a trip hammer to crack a walnut. Nevertheless, the nut is effectively cracked." My "trip hammer" was composed of the following: A photo-electric cell, spot light, house-current solenoid, clamp, twelve-inch "two-by-four," and .22 caliber rifle. Henry always arrived in the kitchen via a floor register in the pantry. I arranged the foregoing materials on the floor so that when the light beam was intercepted, the solenoid discharged the gun, sending the bullet along the light beam into the "two-by-four." At 4:30 A.M., Henry obligingly committed suicide.—R.J.B., Columbus, Ohio.

## Take This Elevator If You're Interested in Higher Physics

ANYBODY who's ever twirled a watch chain around his finger knows that as the radius of the arc decreases, the revolutions of the watch chain speed up. Now, let's take an elevator—take it up to the eightieth floor of one of our tall office buildings. The counterweight goes down as we rise. But the building is on the perimeter of the revolving earth. Therefore the descending counterweight is revolving—at some 700 miles an hour—with it. As the radius of its arc decreases, doesn't it tend to exert a sideward pressure against its tracks? Also don't the cables it's suspended on do likewise, bellying out somewhat? And don't they belly the other way as they travel upward?—P.O.C., East Orange, N.J.

GOING UP!



## But Grandpop! What Wonderful Wars You Had!

I've got a lot of good ideas out of P.S.M., and now it has solved a big problem for me: What I'm going to do for my country in the next war to make the world safe for democracy or whatever it is. In my old age, when my grandchildren gather around my knees and ask, "Grandpop, what did you do in the Second World War?" I'll say, "I served with a mobile airport." That outfit you described in your December issue looks to me like a machinist's dream come true. Chasing across the country with that beautiful assortment of tools and machines would combine the best features of a camping trip and a de luxe home workshop. It would be worth the trouble of dodging a few bombs. You can have your submarines and airplanes to ride in during the next war. Just give me the chance to serve my country in one of those dream workshops. Let the pacifists keep quiet and mind their own business.—A.M., Birmingham, Ala.

## P.S.M.'s Full-Color Pages and New Size Earn a Bouquet

HAVE been a subscriber to P.S.M. for eight years, and I have always been delighted with it—enjoying every page of it. Now it comes in more the form of a book, with smaller but many more pages, and I think this is an improvement. The beautiful full-color pages make it all the more attractive. I wish to thank and congratulate the editor and his staff for this novel improvement in our P.S.M. And I will express the hope that, in this new form, P.S.M. may continue as successfully as it did in the old form, for many years to come.—W.J., The Hague, Holland.

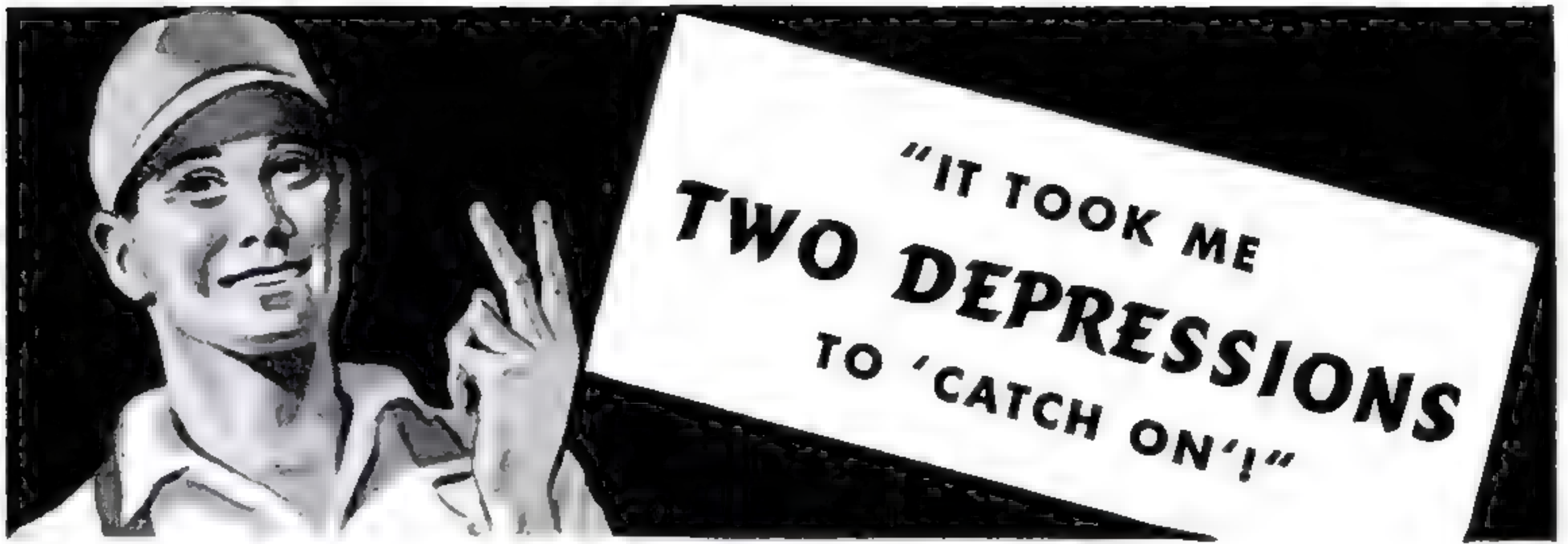
THE COLOR PICTURES ARE MORE PRETTY AS OUR HOLLAND TULIPS, ALMOST!



## A Candid-Camera Fan Gives the Doctor a Tip

REFERRING to the contraption of Dr. James Stotter, the surgeon who photographs his own operations, described on page 79 of the November issue: Ingenious? Yes. Clumsy? Sure. Complicated? Undoubtedly. Efficient? I don't think. A modern miniature camera with a spring-controlled (Continued on page 14)





"Sure, I was 'sitting pretty' in 1928. Good job, swell girl, no worries. Then—*bang!*—it's '29 and I'm one of the first to be fired! Those were a couple of tough years, I'm telling you. Couldn't find work, and I'd been planning to get married!

"When things picked up, I was back at work — coasting along at the same pay on the same job. I got married. Thought some about the future—but didn't *do* anything about it.

"Then 'recession' came, and I was out again! But I noticed something this time. I noticed that the *trained* men, the boys who knew more than A-B-C about their jobs, weren't 'let out' right off the bat! In fact, the four fellows I knew who had been taking I. C. S. Courses kept their jobs right through the slump!

"Then I 'caught on'! I'm back at work again — and, believe you me, I'm going to stay here! The day I was rehired, I *enrolled with the I. C. S.!* They tell me there are 100,000 men enrolled with those Schools right now. (Fact is, I learned recently that my boss is an old I. C. S. graduate.) And if another business slump comes along, I'll be prepared to weather it! Because I know that the *trained* man is the *only* man equipped to 'ride out' stormy business seas!"

• • •

Do employers recognize the value of I. C. S. training? *Nearly 3000 leading industrial organizations have employee-training agreements with the International Correspondence Schools.* Mail the coupon — and mail it *today!*

## INTERNATIONAL CORRESPONDENCE SCHOOLS

BOX 7650-J, SCRANTON, PENNA.

★ Without cost or obligation, please send me a copy of your booklet, "Who Wins and Why," and full particulars about the subject *before* which I have marked X: ★

### TECHNICAL AND INDUSTRIAL COURSES

- |  |  |  |  |
|--|--|--|--|
| <input type="checkbox"/> Architect                 | <input type="checkbox"/> Sheet Metal Worker                            | <input type="checkbox"/> Commercial Refrigeration                            | <input type="checkbox"/> Surveying and Mapping                             |
| <input type="checkbox"/> Architectural Draftsman   | <input type="checkbox"/> Boilermaker                                   | <input type="checkbox"/> Plumbing <input type="checkbox"/> Steam Fitting     | <input type="checkbox"/> Bridge Engineer                                   |
| <input type="checkbox"/> Building Estimating       | <input type="checkbox"/> Telegraph Engineer                            | <input type="checkbox"/> Heating <input type="checkbox"/> Ventilation        | <input type="checkbox"/> Bridge and Building Foreman                       |
| <input type="checkbox"/> Contractor and Builder    | <input type="checkbox"/> Telephone Work <input type="checkbox"/> Radio | <input type="checkbox"/> Air Conditioning and Cooling                        | <input type="checkbox"/> Chemistry <input type="checkbox"/> Pharmacy       |
| <input type="checkbox"/> Structural Draftsman      | <input type="checkbox"/> Mechanical Engineering                        | <input type="checkbox"/> Steam Engineer                                      | <input type="checkbox"/> Coal Mining                                       |
| <input type="checkbox"/> Structural Engineer       | <input type="checkbox"/> Mechanical Draftsman                          | <input type="checkbox"/> Steam Electric Engineer                             | <input type="checkbox"/> Mine Foreman <input type="checkbox"/> Fire Bosses |
| <input type="checkbox"/> Management of Inventions  | <input type="checkbox"/> Machinist <input type="checkbox"/> Toolmaker  | <input type="checkbox"/> Marine Engineer                                     | <input type="checkbox"/> Navigation  |
| <input type="checkbox"/> Electrical Engineer       | <input type="checkbox"/> Patternmaker                                  | <input type="checkbox"/> R. R. Locomotives                                   | <input type="checkbox"/> Cotton Manufacturing                              |
| <input type="checkbox"/> Electric Lighting         | <input type="checkbox"/> Diesel Engines                                | <input type="checkbox"/> R. R. Section Foreman                               | <input type="checkbox"/> Woolen Manufacturing                              |
| <input type="checkbox"/> Welding, Electric and Gas | <input type="checkbox"/> Aviation Engines                              | <input type="checkbox"/> Air Brakes <input type="checkbox"/> R. R. Signalmen | <input type="checkbox"/> Agriculture                                       |
| <input type="checkbox"/> Reading Shop Blueprints   | <input type="checkbox"/> Auto Technician                               | <input type="checkbox"/> Highway Engineering                                 | <input type="checkbox"/> Fruit Growing                                     |
| <input type="checkbox"/> Heat Treatment of Metals  | <input type="checkbox"/> Auto Electrical Technician                    | <input type="checkbox"/> Civil Engineering                                   | <input type="checkbox"/> Poultry Farming                                   |

### BUSINESS TRAINING COURSES

- |  |   |  |  |
|--|---|--|--|
| <input type="checkbox"/> Business Management   | <input type="checkbox"/> Bookkeeping      | <input type="checkbox"/> Service Station Salesmanship                        | <input type="checkbox"/> Grade School Subjects                               |
| <input type="checkbox"/> Industrial Management | <input type="checkbox"/> Secretarial Work | <input type="checkbox"/> First Year College Subjects                         | <input type="checkbox"/> High School Subjects                                |
| <input type="checkbox"/> Traffic Management    | <input type="checkbox"/> Spanish          | <input type="checkbox"/> Business Correspondence                             | <input type="checkbox"/> College Preparatory                                 |
| <input type="checkbox"/> Accountancy           | <input type="checkbox"/> French           | <input type="checkbox"/> Stenography and Typing                              | <input type="checkbox"/> Illustrating  |
| <input type="checkbox"/> Cost Accountant       | <input type="checkbox"/> Salesmanship     | <input type="checkbox"/> Civil Service <input type="checkbox"/> Mail Carrier | <input type="checkbox"/> Cartooning  |
| <input type="checkbox"/> C. P. Accountant      | <input type="checkbox"/> Advertising      | <input type="checkbox"/> Railway Mail Clerk                                  | <input type="checkbox"/> Lettering Show Cards <input type="checkbox"/> Signs |

### DOMESTIC SCIENCE COURSES

- |   |   |  |
|---|---|--|
| <input type="checkbox"/> Home Dressmaking                       | <input type="checkbox"/> Advanced Dressmaking | <input type="checkbox"/> Foods and Cookery                           |
| <input type="checkbox"/> Professional Dressmaking and Designing |   | <input type="checkbox"/> Tea Room and Cafeteria Management, Catering |

Name.....Age.....Address.....

City.....State.....Present Position.....

If you reside in Canada, send this coupon to the International Correspondence Schools Canadian, Limited, Montreal, Canada  
If you reside in England, send coupon to I. C. S., 71 Kingsway, London, W. C. 2, England



# Our Readers Say (CONTINUED)

shutter and film wind and an electrical release would give the good doctor the following advantages: A neater-appearing operating room. Quicker action. A single foot switch. More exposures.—H.G., Milwaukee, Wis.

## Correspondence-School Course Gave Him the Mailing Habit

IN THE November issue, you published a "tricky-channel" problem. What's tricky about it? I am a correspondence-school mathematician so I walked right through it and, from habit, I mail the solution. If A is on the west bank, set your compass course at 56 degrees, 28 minutes, north, and you'll row smack into B. As to the roller bearing, I've never seen one, but I'll bet the groove cross section and the roller contour are not the same. In other words, each roller con-

I HATE LETTER WRITING, SO I DIDN'T GET MUCH EDUCATION



tacts the inner ring at only one point and the outer ring ditto, otherwise they would slip.—P.W., Buffalo, N.Y.

## All His Eggs in One Basket Wasn't the Idea Here

THIS should be the answer to the money-and-envelopes problem given in your May 1938 issue. The number of envelopes received by each family was 1,443, divided within each family as follows: Mrs. Jones, 607 envelopes, \$368,449; Jones, 493 envelopes, \$243,049; Jones child, 343 envelopes, \$117,649. Mrs. Smith, 663 envelopes, \$439,569; Smith, 507 envelopes, \$257,059; Smith child, 273 envelopes, \$74,529. Mrs. White, 777 envelopes, \$603,729; White, 555 envelopes, \$308,025; White child, 111 envelopes, \$12,321.—D.E.C., Chicago, Ill.

## An Electrician Wants Plans for Efficient Parking Lights

ARTICLES on how to install useful things on your car appeal to me very much. I'd like to put in a request for you to assign one of your writers to prepare a good one describing how to hook up auxiliary parking lights, operating on a single switch, that would economize on battery current. I am an electrician by trade and education, and "mechanic born." I enjoy your magazine more than any

ELECTRICIANS MUST BE LIKE DRUG STORES, EVERYTHING BUT DRUGS!



other of the several I have been taking.—H.M.D., West Somerville, Mass.

## This "Rip Van Winkle" Knows When He'd Want To Wake Up

HERE'S to A.E., of Philadelphia, Pa., who asks how long you'd want to sleep if you could go to sleep like old Rip Van Winkle. He wants to know what future date seems most interesting to wake up on. The answer is on page 110 of the same issue of your fine magazine: "The year is 8113," when "Spired cities built by the ancient people of the twentieth century have long since crumbled to dust." For in that year, the "crypt of civilization," described in the article, will be dug up and opened. Of course, some of the information contained in the Oglethorpe University vault would be old stuff, because in the year 6939 the "time capsule" buried under the site of an ancient World's Fair would have been opened. But that would have been just a sample of the material to be found in the unopened vault. I repeat the first sentence of that fascinating article: "The year is 8113."—I.A.C., South Bend, Ind.

SUCH CONCEIT! AS IF WE COULD BE INTERESTED IN SUCH PRIMITIVE TRIVIA!!



## It's Open Season Any Time for Spanking Politicians

JUDGING from their letters, your readers seem to be the type that make our best citizens in this troublous world. Look around you. In all the states, it seems, people believe that getting money from Uncle Sam is the height of getting a living. Those people are not bothered with who supplies the money so long as they get it, and it looks like the politicians think it is all right to hand it out, too, just so long as it is not their own money. The big trouble is that the earnest workers, such as many that write to you, are so busy working that they have no time to check on their fellow citizens. But there will come a time when they will be compelled to stop their work and give the tax eaters what will amount to a spanking—just in what form it is hard to say. Let me add, it's a pleasure to read what the other fellows have to say. So long as we have such outlets for free speech (Continued on page 16)

FELLOW CITIZENS, MY PARTY STANDS FOR—ER HELP!





# THOUSANDS NOW PLAY

*who never thought they could!*



## Learned Quickly at Home

I didn't dream I could actually learn to play without a teacher. Now when I play for people they hardly believe that I learned to play so well in so short a time.

\*H. C. S., Calif.



## Plays on Radio

I am happy to tell you that for four weeks I have been on the air over our local radio station. So thanks to your institution for such a wonderful course.

\*W. H. S., Alabama



## Wouldn't Take \$1,000 for Course

The lessons are so simple that anyone can understand them. I have learned to play by note in a little more than a month. I wouldn't take a thousand dollars for my course.

\*S. E. A., Kansas City, Mo.



## Surprised Friends

I want to say that my friends are greatly surprised at the different pieces I can already play. I am very happy to have chosen your method of learning.

\*B. F., Bronx, N. Y.



## Best Method by Far

Enclosed is my last examination sheet for my course in Tenor Banjo. This completes my course. I have taken lessons before under teachers, but my instructions with you were by far the best.

\*A. O., Minn.

\*Actual pupils' names on request. Pictures by professional models.

## You, too, can play any instrument By this EASY A-B-C Method

**YOU** think it's difficult to learn music? That's what thousands of others have thought! Just like you, they longed to play some instrument—the piano, violin, guitar, saxophone or other favorites. But they denied themselves the pleasure—because they thought it took months and years of tedious study and practice to learn.

And then they made an amazing discovery! They learned about a wonderful way to learn music at home—without a private teacher—without tedious study—and in a surprisingly short time. They wrote to the U. S. School of Music for the facts about this remarkable short-cut method. And the facts opened their eyes! To cap the climax a free demonstration lesson actually showed them how easy it was to learn.

The result? Over 700,000 men and women have studied music at home this simple,

A-B-C way. Now, all over the world, enthusiastic music-lovers are enjoying the thrilling satisfaction of creating their own music. They have found the key to good times, popularity and profit.

And that's what you can do, right now. Simply mail the coupon below. Get the proof that you, too, can learn to play your favorite instrument—quickly, easily, in spare time at home. Never mind if you have no musical knowledge, training or talent. Just read the fascinating illustrated booklet that answers all your questions—examine the demonstration lesson. Both will be mailed to you without the slightest cost or obligation. Tear out the coupon now, before you turn the page. (Instruments supplied when needed, cash or credit.) U. S. School of Music, 81 Brunswick Bldg., New York City.

Forty-first year. (Established 1898)

## FREE DEMONSTRATION LESSON AND BOOKLET

**U. S. SCHOOL OF MUSIC**  
81 Brunswick Bldg., New York City

Without cost or obligation to me, please send me your free Illustrated booklet and demonstration lesson. I am interested in the instrument checked below:

PIANO  
VIOLIN  
GUITAR  
PIANO ACCORDION  
PLAIN ACCORDION  
SAXOPHONE  
CELLO

HAWAIIAN GUITAR  
BANJO  
MANDOLIN  
UKULELE  
CORNET  
TRUMPET  
HARP

CLARINET  
TROMBONE  
FLUTE  
PICCOLO  
ORGAN  
DRUMS AND TRAPS  
HARMONY AND COMPOSITION  
VOICE CULTURE

Name..... Have you..... This Instr. ?.....

Address.....

City..... State.....



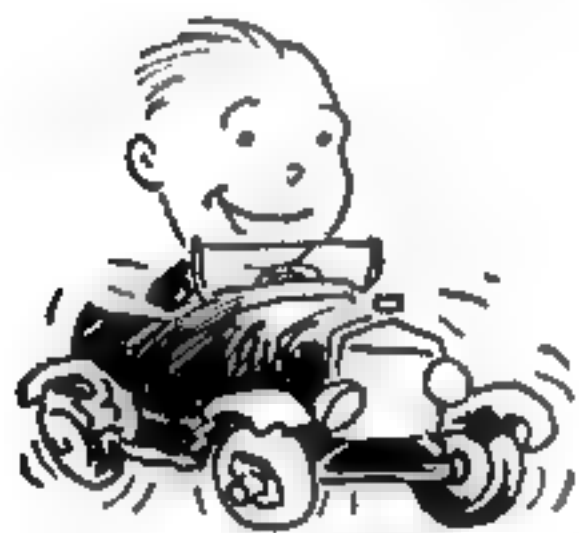
# Our Readers Say (CONTINUED)

as magazines like yours afford us, there's little chance that any dictatorship will overtake us.—G.F.B., Fort Worth, Tex.

## Pick Up Your Trains and Go Home When He Starts Experimenting

MAY I submit a theoretical question, the answer to which I'm in doubt about. Assuming

EASY, THE HIGH PRICED CAR ALWAYS GETS THE WORST OF IT!



that two forces, let us say automobiles, are rushing toward each other on a level road. If one is going 100 miles an hour, and the other eighty miles an hour, which car would be damaged the more when colliding head-on? My theory is that if they were of similar make and model, they would be equally wrecked. One way to experiment,

which I am not equipped for, would be to run two model trains into each other, going at different speeds. On the front of each have some kind of scale to record the force of the blow each receives.—J.R., Rankin, Pa.

## He's Not Quite Tuned to the Proper Wave Length

SINCE becoming a regular reader of your magazine more than a year ago, I have eagerly anticipated the arrival of the new issue each month. But I always have to skip over the radio section and, much to my disappointment, leave those excellent-looking plans untried. I do this for one reason only: I don't know the first thing about radio. Therefore, I suggest for the benefit of others in the same fix that you include material to help the beginner learn the fundamentals of radio in your future issues, supplemented by lists of references for more advanced reading. This may also apply to the photography department.—D. da C., Oxford, Ohio.

## So a Steam Roller Standing Still Is Perfectly Streamline

IT STRIKES me that A.R.I. is a little off on just what is meant by "streamline." He says it is an "absolute" word, like "unique," so that there can be only one perfectly streamline design for an airplane, boat, automobile, or what have you. He forgets that an object may be perfectly streamline for traveling through a given medium at a certain speed, but not for all speeds. For when the speed is stepped up, or down, the object must be redesigned to present a new ideal shape for minimum surface resistance. The best engineers can do is design a car, for example, that presents minimum air resistance at its average operat-

ing speed. When they have done this, I say that they are justified in calling their car "streamline." Justified by common usage of the word and by practical common sense.—O.T.J., Milwaukee, Wis.

## He Has No Kicks Except for the Kickers

THE writer has been a subscriber for the past several years, and has no kicks. The truth of the matter is, if it were up to the persons who are crabbing about the magazine to publish it, I am afraid that the subscription list would be speedily reduced.—T.C.E., Manitowoc, Wis.

## This Is No Subject To Bring Up in the Middle of Winter

MAY I correct an error of statement on page 67 of your November issue. Your correspondent says that the water in the storage lakes will always be above freezing, even in subzero weather, "due to the enormous pressure of the ice and water above." This is not true. The freezing point of water is very insensitive to pressure. The truth of the matter is that when any body of water is cooled sufficiently, convection currents are set up, causing the entire mass of water to become the same temperature, namely, four degrees centigrade, which is the temperature of maximum density. After this, ice forms on the surface and acts as an insulating blanket to the water below. If the cold spell lasts long enough, the ice becomes thicker and thicker, and at the same time a better insulator. The water at the bottom of the lake remains at the constant temperature of four degrees, provided the ice layer does not reach the bottom, which it will not do if the lake is deep enough.—D.O., Berkeley, Calif.

## How Many Fruit Cans Will Fill Up This Box?

Isn't it time for another problem for the solid geometers? A box whose inside dimen-



sions are 6" by 24" by 27" is to be filled with fruit cans whose diameter is 3" and height 6". The problem is to pack the maximum number of cans into the box. Contrary to the obvious solution, the correct answer is not 72. Although I am fond of solid geometry, I cannot solve the problem. Yet the answer doesn't seem very far beyond

my grasp. Can some of my fellow puzzle fans help me out.—B.S., Chicago, Ill.

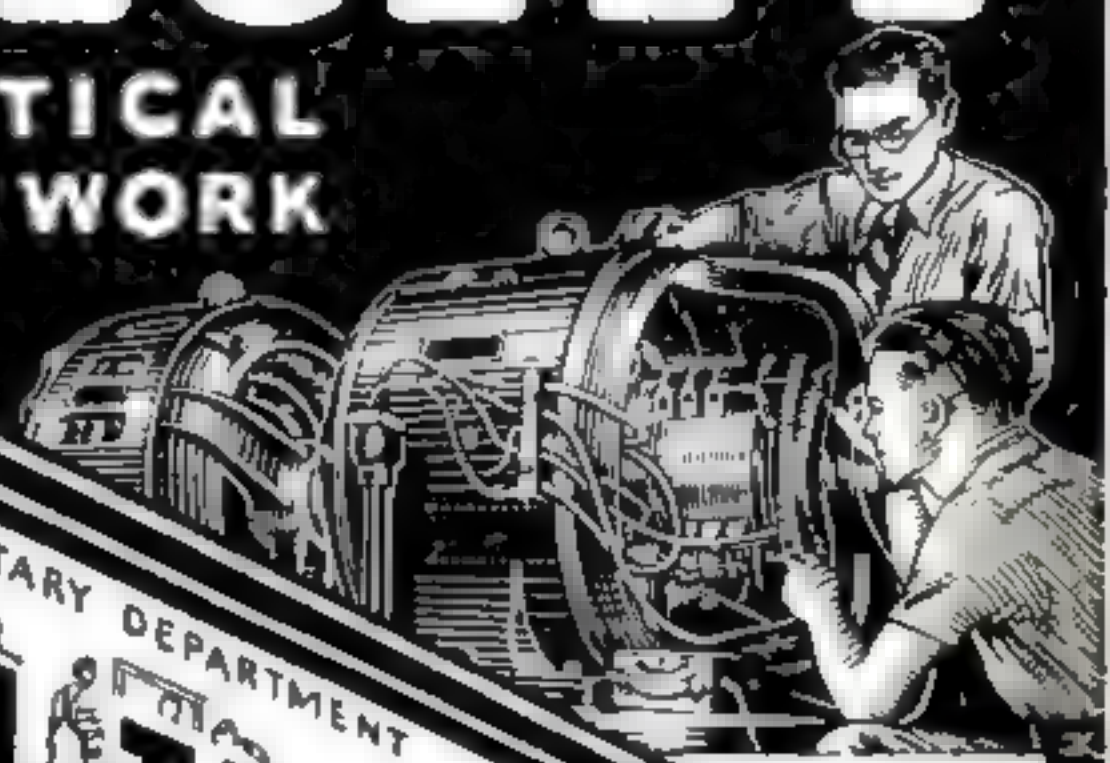


TRAIN  
FOR

# ELECTRICITY

12 Weeks

PRACTICAL  
SHOP WORK



*H. C. Lewis*

## I'LL FINANCE YOUR TRAINING

Send me the coupon below and I'll tell you all about my quick, easier way to train for your start towards a better pay job in electricity. Get your training **FIRST**—Then pay for it in easy monthly payments starting 60 days after your regular 12 weeks training period ends. Electricity offers to many the opportunity for a better job, more money and a real future. Get into a fascinating well-paid field where trained men make good money.

### LEARN BY DOING ON REAL ELECTRICAL EQUIPMENT

In the Big Chicago Coyne Shops you "Learn-By-Doing" on real motors, dynamos, generators, etc. You learn to wind real armatures, wire houses, operate real switchboards. **FIRST**—You are told how to do a thing... Then—**YOU DO IT YOURSELF**. Can you imagine an easier or quicker way to Learn?

### DIESEL, AIR CONDITIONING ELECTRIC REFRIGERATION

Training **NOW** included in these important branches of Electricity without extra cost. This valuable instruction should offer you more opportunities in the electrical field.

### COYNE ELECTRICAL SCHOOL

H. C. LEWIS, PRESIDENT  
500 S. Paulina St., Dept. 19-73, Chicago, Ill.

### MANY EARN WHILE LEARNING EMPLOYMENT HELP AFTER GRADUATION

If you need part time work to help you pay living expenses while training, my Employment Department will help you find it. After you graduate, you get **FREE** Lifetime Employment Service. Send coupon today for full particulars.

### GET THE FACTS

Don't let lack of money keep you from sending in the coupon **NOW**. My Big **FREE** Book is full of facts and photographs which tell you about Coyne Training. I will also send you the details of my "PAY-TUITION-AFTER-GRADUATION" plan, **SPARE TIME EMPLOYMENT OFFER**, **GRADUATE EMPLOYMENT SERVICE**, **LIFETIME PRIVILEGE OF REVIEW**, AND OTHER ADVANTAGES.

### PREPARE FOR OPPORTUNITIES LIKE THESE:

R. R. Signal Wireman, Housewiring, Telephone Maintenance, Illumination Man, Armature Winding, Motor Repair Man, Power Plant Operator, Maintenance Electrician, Auto Ignition and Battery, Air Conditioning, Electric Refrigeration, and many others.

H. C. LEWIS, Pres.,  
**COYNE** Electrical School, 500 S. Paulina St., Dept. 19-73, Chicago, Ill.

Dear Sir: Please send me, absolutely Free, your Big New Book and full particulars of your "PAY-TUITION-AFTER-GRADUATION" PLAN and all other details of your offer.

Name \_\_\_\_\_

Address \_\_\_\_\_

City \_\_\_\_\_ State \_\_\_\_\_

Mail in Envelope or Paste on Postcard.

**MAIL THIS COUPON NOW!**





# AUTO

BOOKS SENT FREE



## CAN YOU FIX IT?

These wonder books tell step by step HOW to take out "play" in differential—to kill the shimmy in steering—to set TIMING—how to put your finger instantly on engine trouble and then the quick expert way to FIX it. Newest improvements fully covered. Equal to a complete trade course at less than a fourth the cost.

**6 BIG VOLUMES**  
Brand New Edition  
2500 pages, 2000 illustrations, wiring diagrams, etc., including Marine Engines, Aviation Motors, Diesel engines, etc. De Luxe edition, gold-stamped flexible binding.

### AMERICAN TECHNICAL SOCIETY,

Drexel Ave. & 58th St., Dept. A 120, Chicago, Ill.

I would like to see the new 6-volume edition of your AUTO BOOKS. I will pay the few cents delivery charges only, but if I choose to, I may return them express collect. If after 10 days use I prefer to keep them, I will send you \$2 and pay the balance at the rate of only \$3 per month, until \$24.90 is paid. Please include free membership and extra volume, as per your offer above.

Name.....

Address.....

City..... State.....

Attach letter stating age, occupation and name and address of employer and that of at least one business man as reference.

on approval. Just mail the coupon and we'll send you a set of these remarkable auto books, just off the press. Whether you are a mechanic or helper, expert or apprentice, auto owner or driver, if you're interested in knowing all about automobile mechanics, take advantage of this FREE OFFER.

## GET A BETTER JOB

A better job—in the gigantic auto industry. BIGGER PAY—a chance to go into business for yourself and get a share of the huge profits, are waiting for any man who even half tries to improve himself. Learn auto engineering with these wonder books a new way—without studying or memorizing. Simply use the JIFFY INDEX to look up the answer to any auto problem. Built by eleven of America's greatest automobile engineers, and written in simple language so you can understand it. Very newest cars, all covered.

**FREE** Privilege of consulting Automobile Engineers of American Technical Society for one year without cost if you mail Coupon immediately.

Send NOW and we will include an EXTRA volume full of up-to-date wiring diagrams.

# \$200 My First Week



... Now in my OWN Business.

L. A. Eagles took in \$200 his first week. Harry Hill says: "Paid for home with Rug-Washer. Earned \$86 first day." Another letter says: "Made \$70 in 13 hrs." Many others make \$125 to \$200 per week. Thousands earning quick, easy profits. Electricity does the work. Finishes rugs like new, on customer's floor. Hundreds of customers in your own vicinity and nearby towns.

## EASY TERMS

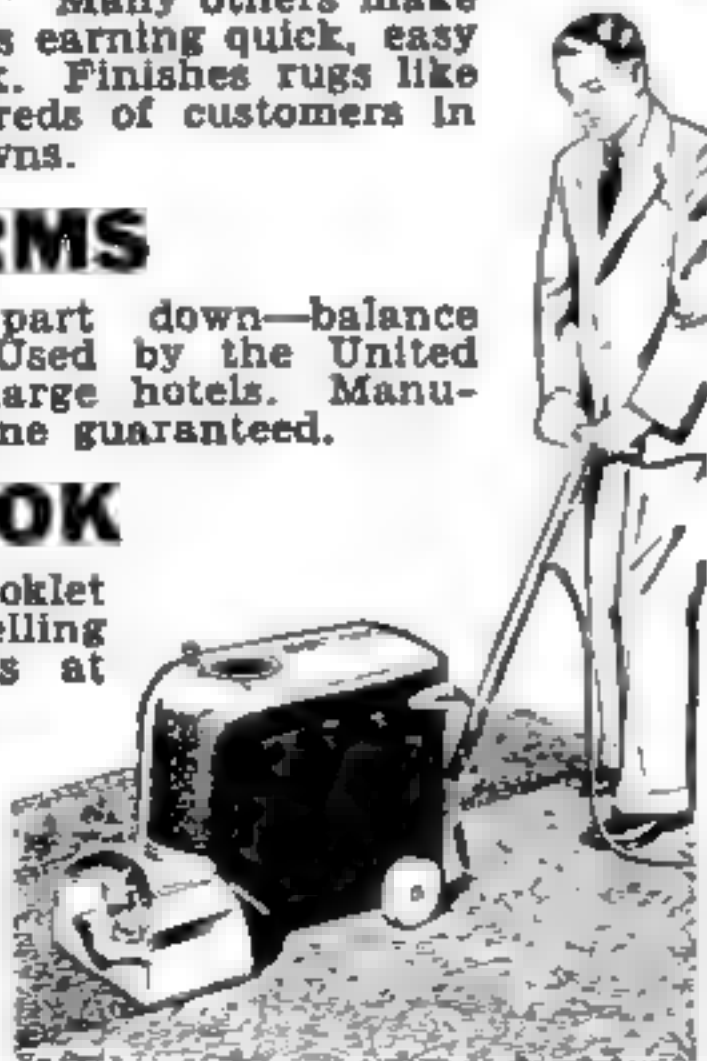
Inexpensive equipment. Pay part down—balance monthly. No shop necessary. Used by the United States Government and many large hotels. Manufactured since 1918—every machine guaranteed.

## FREE BOOK

Send today (no obligation) for booklet illustrating Rug-Washer and telling how you can earn large profits at prices below other methods; how you can build a permanent year-round business; and how you can pay on easy terms. Enjoy a larger income. Write today—NOW.

VONSCHRAMER MFG. CO.

361 Pl., Racine, Wis.



# Learn to MOUNT Birds and Animals



## FUN-FASCINATION PROFITS—IN SPARE TIME

Learn TAXIDERM Y at home BY MAIL. Save your hunting trophies, decorate your home and den, have a grand HOBBY. This old reliable school (with 250,000 students) will teach you at home to mount BIRDS, ANIMALS, FISH, GAME-HEADS—and to TAN hides and furs by wonderful KROME-TAN system, also NOVELTY TAXIDERM Y, using common specimens—no wild game needed.

**FREE BOOK** can learn Taxidermy easily, quickly, at home. Tells how to EARN FINE PROFITS in spare time. Rush letter or postal for this strange marvelous FREE BOOK. Write NOW—TODAY. State AGE.

N. W. School of Taxidermy • Dept. 3391 • Omaha, Neb.

## BE A CAMERA REPORTER



**MAKE YOUR CAMERA BRING YOU A CASH INCOME.** Interesting, Easy-to-Learn, Spare Time Course Prepares You For Exciting Profession. Earn Money While You Study! Camera Reporting, Picture shooting, for scores of newspapers and magazines. A high paying profession that any man or woman can enter! YOU NEED NO EXPERIENCE. You learn by doing. 'Tasope' trains you for a good job, or you can work for yourself. Most modern practices, including natural color photography! All popular cameras. Low Cost—Easy Payment Plan. Write for Beautiful Free 32-Page Photo-Illus. Book.

**TASOPE' SCHOOL OF MODERN PHOTOGRAPHY,** Dept. 10X8, Aurora, Mo.

## Big PAY in AVIATION



Be a Transport Pilot! Earn up to \$6000 a year! Or an Airplane Mechanic at \$2000 a year! This LINCOLN GOVERNMENT APPROVED SCHOOL can train you for a good pay position in Aviation. Learn to fly fast, modern Airplanes, repair and overhaul aircraft motors; design and build real Airplanes. We teach you how and assist Graduates in locating positions. Part-time employment for board and room while training. WRITE TODAY for complete information.

Lincoln Airplane & Flying School  
611 Aircraft Bldg. Lincoln, Nebraska.



**WHY NOT** spend spring, summer, fall, gathering butterflies, insects. I buy hundreds of kinds for collections. Some worth \$1 to \$7 each. Simple outdoor work with my instructions, pictures, price list. Profit—pleasure. Send 10c (not stamps) for Illustrated Prospectus before sending butterflies.

MR. SINCLAIR, DEALER IN INSECTS  
Dept. 7, Box 1830 San Diego, Calif.

## DO-IT-WITH-SQUABS

Steadily raised in ONLY 25 DAYS. Why breed for ordinary trade when luxury markets want all the squabs you can ship, every day in year? Go after this desirable, profitable trade now. Write postcard, get eye-opening free picture book, read how well others are doing.

RICE FARM 611 Howard St. Melrose, Mass.

## SHORT CUTS IN ARITHMETIC

This book, fully illustrated, presents in a very simple manner amazing new short cuts in multiplication, division and other arithmetic processes. Don't be slow with figures. Learn how to multiply mentally 85 x 65, 87 x 63, 66 x 28, 996 x 987, 658 x 999, etc. Do these and similar problems faster than you can say Jack Robinson and without a pencil. Send 50 cents for this valuable book.

JAYEL PUBLISHING CO. Dept. 1049 10 West 47th St. New York, N. Y.

## Learn Photography at HOME

Splendid opportunities. Prepare quickly in spare time. Easy method. No previous experience necessary, common school education sufficient. Many earn while learning. Send for free booklet "Opportunities in Modern Photography", particulars and requirements.

AMERICAN SCHOOL OF PHOTOGRAPHY  
3601 Michigan Avenue Dept. 1361 Chicago, Illinois



# INVENTORS

## COMPLETE INFORMATION ON HOW TO OBTAIN PATENT AND MARKET INVENTIONS

If you have ideas, if you have invented something, if you're interested in inventing something, you need this new 48-page book that gives the entire Story of Patents. It tells you for the first time about new phases of invention, how others succeeded, how the patent laws protect you, how to market your invention, where to obtain finances, how to form a company, partnership, or arrange for royalties from your invention's sale.

### PRACTICAL BENEFITS

You will find 6 complete pages illustrated with simple inventions that have succeeded in six different fields of industry. Over 100 illustrations are in this book. You will read the stories of ten (illustrated) of America's most famous inventors. You will find an experienced and thorough survey of market conditions affecting the inventor—showing the possibilities for commercial invention today. Entire chapters are devoted to the value of a patent in promoting the final success of your invention. The importance

of quick action in applying for patent is stressed—facts revealing danger of delay are emphasized.

If you expect to realize profits from your invention you must protect it with a U. S. Patent. Otherwise you may find that all your time and labor have been lost, because it often happens that other inventors are working on the same idea. If you have an idea, an invention, or an ambition to invent—get the information on obtaining patent **AT ONCE!**

### WHAT A PATENT DOES FOR YOU

Without a U. S. Patent, you cannot expect to reap the profits that your invention may make possible. Send at once for this book. After you get that, you'll know exactly what to do to protect yourself. Anything you write us or send us is strictly confidential between us. All letters and drawings are kept in strong, steel, fireproof files, which are open only to us or authorized members

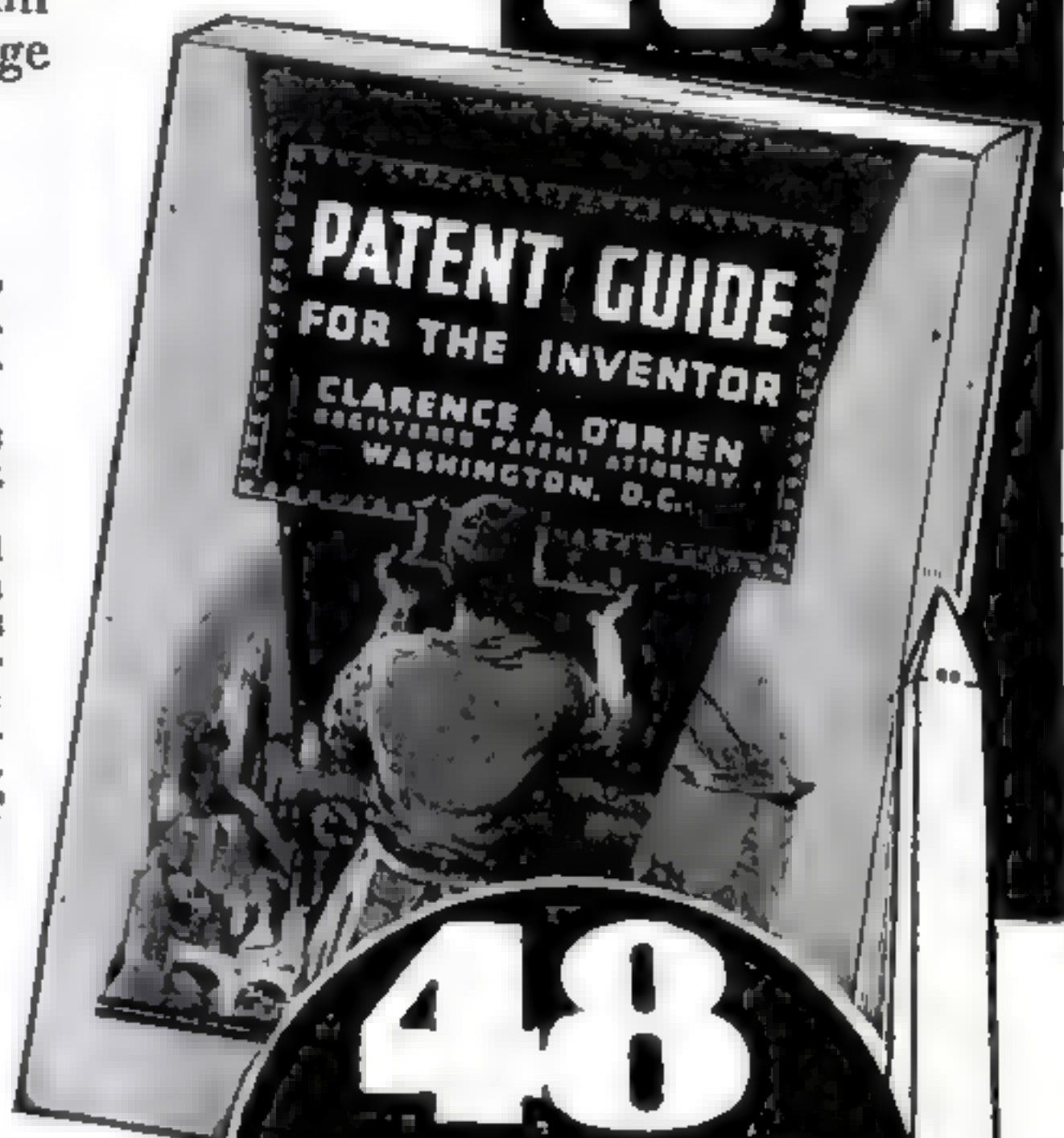
of our staff. We have secured patents for inventors located in every State in the Union. The practice of our organization is confined entirely to Patents, Trademarks and Copyrights. We have had years of experience in Patent Matters. When you place your idea in our hands, we are in position to proceed at once to secure protection for you. Our fees are reasonable, and if you desire, we can arrange convenient terms of payment.

*Get This*  
**FREE BOOK**

**IMMEDIATELY MAIL COUPON TODAY!**

This new 48-page book of facts is absolutely **FREE!** You need it **NOW.** Simply fill out the coupon, and mail. The field of invention changes constantly—here is the latest information. Within a very few days you will receive our Free Book, together with the Record of Invention Blank described here. Write **NOW.**

*Get*  
**FREE COPY**



**48**  
**PAGES**  
*Over 100*  
*Illustrations*

**CLARENCE A. O'BRIEN**  
**and HYMAN BERMAN**

**887 Adams Building, Washington, D. C.**  
Registered Patent Attorneys Before U. S. Patent Office

Please send me at once your Big Free 48-Page Book, "Patent Guide for the Inventor" and your specially prepared "Record of Invention" form. This request does not obligate me.

Name.....

Address.....

(Please write or print plainly)



# 15,000,000

Electric and Gas Refrigerators in  
the United States

... and a million more commercial plants  
of various types and sizes

All of them are getting older every  
day ... service and repairs alone  
will provide *Work*  
**FOR THOUSANDS  
OF TRAINED MEN**

... the very kind of training pro-  
vided for the industry by the Thermo  
Air Conditioning Inst. And refrigeration  
is only a part of the *complete*  
training in Air Conditioning given  
by Thermo A. C. I.

*Send coupon* and find out how  
easy it is to get this training for  
refrigeration and air conditioning  
careers -- no matter where you live.

**THERMO AIR CONDITIONING INST.**

LOS ANGELES . . . 194 S. Alvarado St.  
CHICAGO . . . 125-B W. Hubbard St.  
NEW YORK . . . 1755-B Broadway

Please send information on training for Re-  
frigeration & Air Conditioning opportunities.

Name \_\_\_\_\_ Age \_\_\_\_\_  
Street \_\_\_\_\_  
City \_\_\_\_\_ State \_\_\_\_\_ t-13-s

Send this coupon to Thermo Inst. address nearest you.

## STUDY ENGINEERING AT HOME

Home Study Courses leading to Degrees in Electrical, Civil, Mechanical, Drafting, Architectural, Automotive, Steam, Diesel, Aeronautical, Radio, Structural Mining, Industrial, Highway, Petroleum, Marine, Refrigeration, Air Conditioning, Chemical Engineering, Arts, Sciences, Philosophy, Education, Public Health, Psychology, Sociology, Physics, Chemistry, Geology, Pol. Science, Theology, Law, Agriculture, Business Training, Accounting, Statistics, Adv. Sales, McKinley-Roosevelt Graduate Colleges, 4204 Clarendon Avenue, Chicago

## ENCYCLOPEDIA \$1.79!

In **ONE Volume** Formerly in 4 Vols. for \$15.50  
Famous **FACTS** Encyclopedia, revised 1938 edition.  
1292 pages, 30,000 subjects, 3200 illustrations, 8 1/4 x 5 1/2 x 2 ins., green buckram stamped in gilt and black. "The work I shall now chiefly turn to" says Prof. John Erskine, Columbia U. Examine 5 days **FREE**, then send \$1.79 or return book. Save 80% of original price. Write today.  
**NELSON DOUBLEDAY, INC., Dept. 1 PSM, Garden City, N.Y.**

## SEVEN WONDERS of the WORLD

**FREE**

Pictured in **FULL COLOR**—Each 7 1/2 x 10 1/4". Send only 10¢ to cover mailing costs. The wonders you have longed to see, reconstructed from recent discoveries and painted by famous artists, so you can view them at the height of their glory and read their stories. 24 page booklet. Educational! Entertaining! Mail 10¢ to

WM. H. WISE & CO., Dept. 801, 57 West 47th Street, New York City.

## MAKE MONEY AT HOME

**RUBBER  
MOLDS**

Low as  
**6¢ EA.**



Amazing rubber mold-making outfit makes perfect flexible molds of plaques, ash trays, book-ends, etc. Molds cost from 6¢ to 25¢ each. Each mold makes hundreds of novelties and gifts to sell up to \$1.00 apiece! No experience necessary. Quick and easy. Start profitable business in your home. Sell to stores, gift shops, friends, resorts, road stands, by mail. Full or spare time. "Molders Handy Book" and list of buyers **FREE**. Write

**SO-LO WORKS**  
Dept. N-823 Cincinnati, Ohio

## Industry Needs MECHANICAL ENGINEERS

Big opportunities for men with Engineering training. Promote yourself by preparing for jobs as Engineer, Superintendent, Master Mech., Factory Eng., Chief Draftsman, Gen'l Foreman. You mechanically employed men don't have to change lines to win promotion, but do have to get ready for jobs ahead. Write today for method for preparing for this well-paying profession. No obligation.  
**American School, Dept. M 146, Drexel at 58th, Chicago**



**FREE  
CATALOG**

## HOW TO MAKE BETTER PHOTOS

Stop wasting good film! Do away with unnecessary camera expense! Take a good picture every time! The kind you'll be proud to show. Sell your photos to magazines and newspapers. Our easy, convenient home-study course will show you **HOW!** Write today for **FREE Catalog!** **UNIVERSAL PHOTOGRAPHERS, Dept. 81, 10 West 38 Street, New York City**



## LEARN to DRAW

beautiful girls' heads and figures from large photos of artists' models. Be an artist. Turn your talent into dollars. Simple method makes it easy. No experience necessary.

### FREE SAMPLE CHARTS AND PICTURES

Send your name and address today, and only 10¢ to cover mailing cost. **TRY IT FREE** without obligation.

**TOWERTOWN STUDIOS, Dept. 138  
826 NORTH MICHIGAN AVENUE, CHICAGO, ILLINOIS**

## Original POEMS — SONGS WANTED FOR PUBLICATION

**WESTMORE MUSIC CORP.**

Dept. 55F

Portland, Ore.



## Learn to Write

Begin Today. Write for our Free Book, "How to Become a Good Penman." It contains specimens and tells how others learned to write in spare time. Your name elegantly written on a card if you enclose stamp for postage. Write today. **The Tamblin School of Penmanship, 437 Ridge Bldg., Kansas City, Mo.**



## BE A CARTOONIST

**AT HOME** IN YOUR SPARE TIME under personal supervision of the famous cartoonist **NORMAN MARSH** creator of "DAN DUNN" appearing every day in big papers. **Success—Fame—Real Money** may be Yours when you learn Marsh's easy simple methods and secrets. Send name and address for free details of **MARSH'S** Personal course. **ACT TODAY!**

**MARSH CARTOON SCHOOL**

Chicago Daily News Bldg., Dept. A-200, Chicago, Ill.



## MECHANICAL DENTISTRY AT HOME!

To make Crowns, Plates, Bridgework, etc., for Dentists. Easy practical way to learn mechanical dentistry at home in spare time.

**FULL EQUIPMENT OF TOOLS AND MATERIALS INCLUDED WITH COURSE.** Low tuition. Easy terms. Write for **FREE BOOK** about this money making profession that is not affected by machine age.

**McCarrie School of Mechanical Dentistry**  
207 N. Broad St. Dept. 665 Philadelphia, Pa.



# PATENT and SELL your INVENTION

## A Simple Recipe for Inventive Success

PROBABLY the simplest recipe for inventive success would be this: First, a practical, useful invention; second, a good strong Patent; third, a buyer or a market. The inventor needs all three to get anywhere. Lacking any one, he is likely to get nowhere. The recipe is simple. Working it out isn't so simple. That is why inventors—and others inventively inclined—have found the two books shown here so helpful. We've gone into each part of the recipe carefully. Exactly what is an invention? We tell you. What is a strong patent? We tell you. How can I go about finding a buyer? We tell you.

## Many Questions Answered

But there's much more. For example, just how an Application for a Patent is made; how an inventor can safeguard himself with dated sketches as he goes along; how the pertinent Patent Office records are checked to see what other inventors may have done along the

same line; how some successful inventors have secured financial backing; simple ways to contact manufacturers; and many other points.

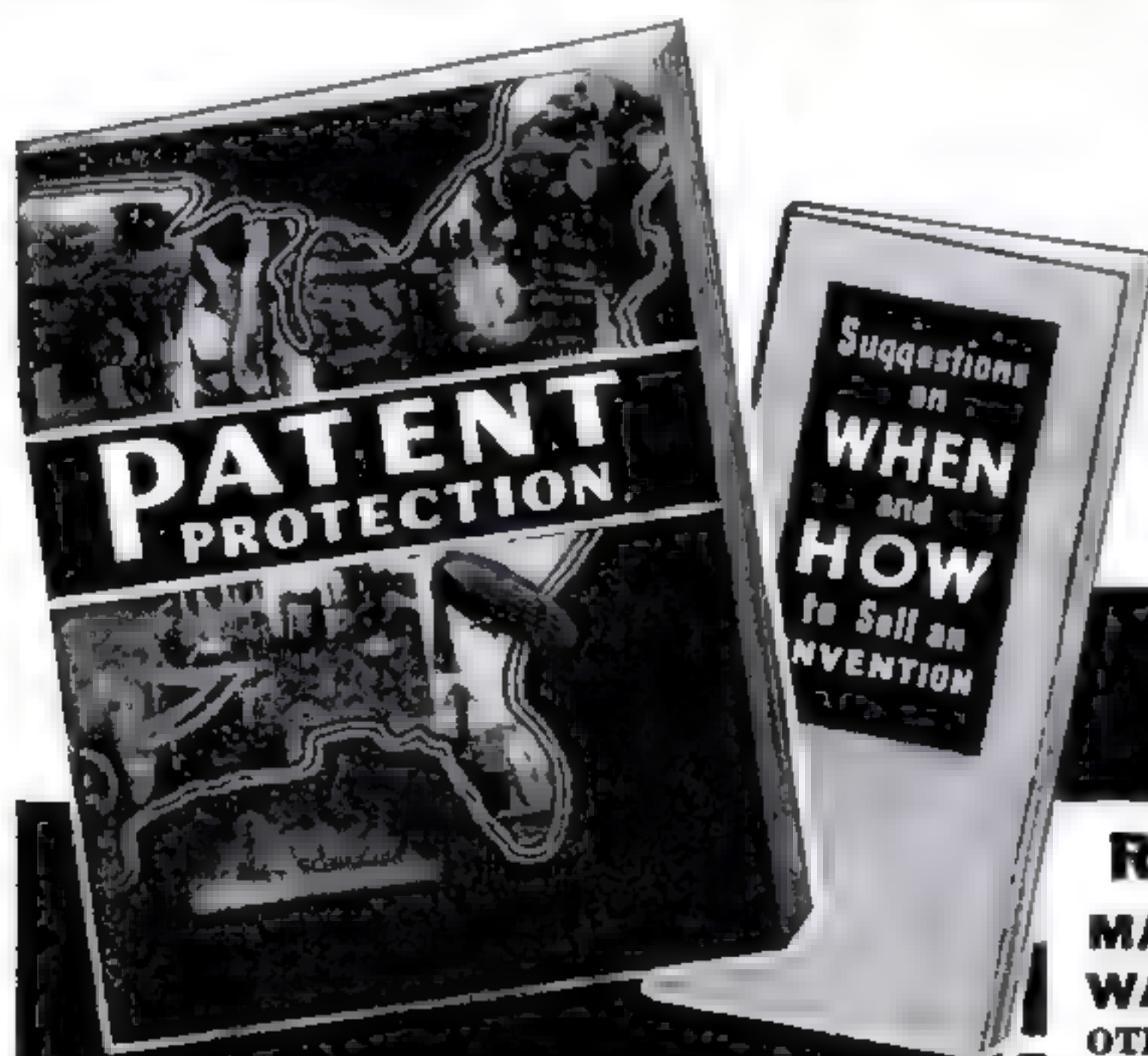
## 41 Years in the Business of Helping Inventors

The world needs, can use and will pay for practical, useful inventions. Manufacturers are on the alert for new articles, or improvements that will help them increase sales. Maybe you have one. Maybe not. These books will help you in deciding that. From that standpoint alone, they are valuable.

For more than 41 years, it has been our business to help inventors. We answer your questions and supply complete information about Patent procedure, costs, steps to take, kind of sketch or model needed, and much more. Our staff is made up of experienced Registered Patent Attorneys, Draftsmen, Searchers. Fees are reasonable—deferred payments arranged. Whether your idea is large or small, finished or still in a rough stage, you should have the facts both about Patenting and Selling. The information which we give you—based on long experience with thousands of inventors—is yours for the asking. No need to delay. These two books of facts may save you time, trouble, money, even later disappointment. Return the coupon—or write us a confidential letter—today.

## 115 Mechanical Movements Shown

In our book "Patent Protection" you will find illustrated 115 different mechanical movements. Maybe you'll find just what you need to work out some of your own ideas. Many other interesting pictures are shown in this book. Both books and an "Evidence of Invention" form sent to you FREE the same day we hear from you.



These 2 books tell you  
how to go about it ..  
**Both Sent FREE** ➤

VICTOR J.  
**EVANS & Co.**

## REGISTERED PATENT ATTORNEYS

MAIN OFFICE: 107-A, VICTOR BUILDING  
WASHINGTON, D. C.

### OTHER OFFICES:

514-C Empire Building, Pittsburgh  
405-C Garfield Building, Los Angeles  
1010-C Hobart Building, San Francisco

Send me FREE copies of your books, "Patent Protection" and "When and How to Sell an Invention." (Note: Same books supplied by any of branch offices listed above.)

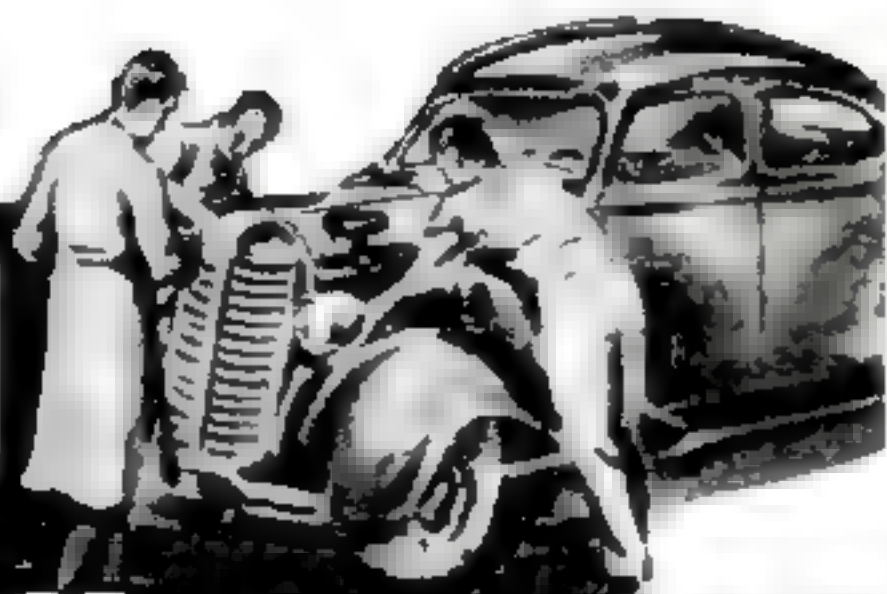
Name .....

Street and No.....

City or Town.....State.....



# Learn AUTO Mechanics



**QUICKLY  
IN A FEW WEEKS**

**Good-Pay Jobs  
Are Available!**

Trained men earn top wages in these fascinating well-paying trades. This is not a correspondence school—no books—no lessons. Don't look for a job—**TRAIN FOR IT.** Read below how a McSweeney-trained man made good.

## LEARN EASILY, QUICKLY:

- **AUTO MECHANICS**
- **AVIATION MECHANICS**
- **DIESEL MECHANICS**

**Collision Repair (Complete)  
Body and Fender Repair  
Auto Painting**

- **WELDING—Arc and Gas**

## You Get Actual Shop Training

Work on real equipment with real tools. In a few weeks you should be trained by actual work to hold down a Good Pay Job.

**We get  
many letters  
like this**

1801 E. 65th St., Cleveland, O. Dear Mac—Immediately after leaving school I went to work for United Motors and am now located in Cleveland where I hold a good position. I have been able to take care of the most complicated electrical jobs. I think I have done fine considering I had no experience before coming to your school.  
—Hubert Todd

## LEARN NOW—PAY LATER!

We will give you complete information on how to get your training now and pay for it later out of your earnings.

**FREE** Write today for Big Free Book. Get the facts about jobs; and low Tuition Offers. Mailing the coupon does NOT obligate you. It obligates ME to tell YOU how you can train for Big Money in a few short weeks. Address Dept. 6-1.

# McSWEENEY SCHOOLS

**DETROIT, MICH. and KANSAS CITY, MO.**

Write Our School Nearest You



**DETROIT**

**In Big New  
McSweeney  
Buildings**

The finest of their kind. Every modern facility for thorough instructions.



**KANSAS CITY**

## McSWEENEY TRADE SCHOOL

Dept. 6-1, Detroit, Mich., or Kansas City, Mo.

Without cost or obligation send me your big FREE Book.

**I am interested  
in the course on**

Name \_\_\_\_\_

Street \_\_\_\_\_

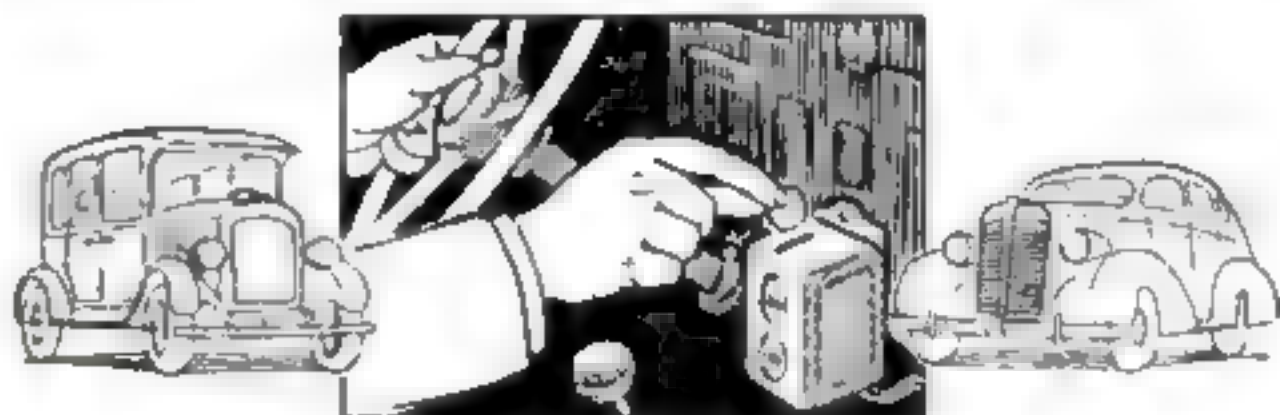
Town \_\_\_\_\_

State \_\_\_\_\_

Age \_\_\_\_\_

## With the Inventors

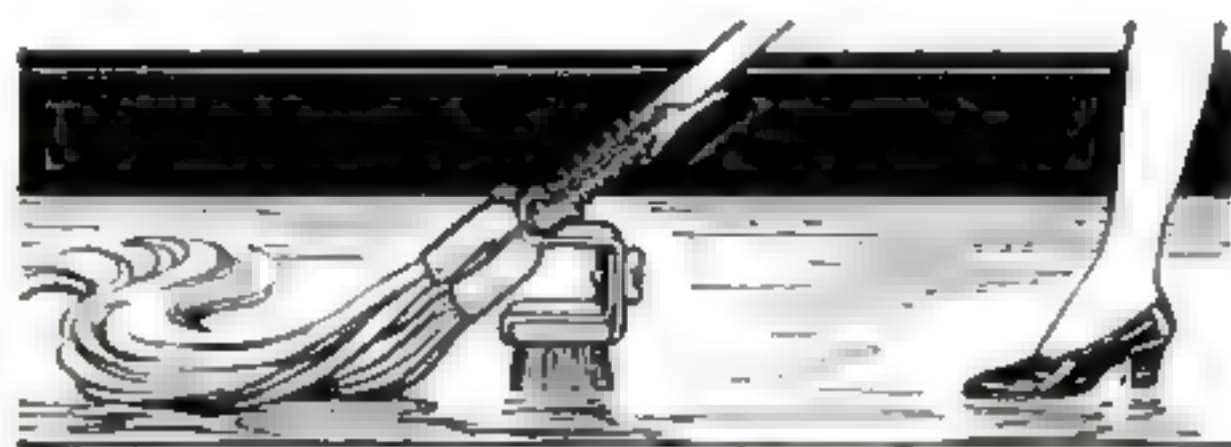
HOW would you like to have cash ready and waiting to buy a brand-new car when your present jalopy finally begins to creak and groan with age? George Miller, of Chester, Pa., recently invented a "depreciation meter" to make this dream come



true. The device, attached to your present car, would make it impossible for you to run it until you dropped the price to cover depreciation, wear, and tear for a given number of miles into the meter. When the car finally gives up the ghost, the meter will have collected enough money for a new automobile. Sounds something like the old-fashioned gas meter that had to be fed a quarter before it would let through enough fuel to cook supper. . . EASE IN



WASHING a car is the idea of an implement designed by Burgess Cockcroft, of Chicago, Ill. The nozzle at the end of a length of flexible hose is held in the palm of a person's hand by metal rings that clamp around the fingers. When the hose is attached to a garage faucet, clean water flows continu-



ously into the sponge or cloth with which the car is being washed. . . ANOTHER CLEANING AID goes to the credit of David Paul, a Brooklyn, N. Y., inventor. This is a metal holding device by which a scrub brush can be attached near the base of a mop handle. Floors can thus be scrubbed and mopped at the same time. . . BRAKES AND ACCELERATOR of an automobile are controlled by a single pedal in a device worked out by John W. Ruhstorfer, of Detroit, Mich. Mounted on a

(Continued on page 24)





**IF** you're that man, here's something that will interest you.

Not a magic formula—not a get-rich-quick scheme—but something more substantial, more practical.

Of course, you need something more than just the desire to be an accountant. You've got to pay the price—be willing to study earnestly, thoroughly.

Still, wouldn't it be worth your while to sacrifice some of your leisure in favor of interesting home study—over a comparatively brief period in your life? Always provided that the rewards were good—a salary of \$2,000 to \$10,000?

An accountant's duties are interesting, varied and of real worth to his employers. He has *standing*!

Do you feel that such things aren't for you? Well, don't be too sure. Very possibly they *can* be!

Why not, like so many before you, investigate LaSalle's modern Problem Method of training for an accountancy position?

Just suppose you were permitted to work in a large accounting house under the personal supervision of an expert accountant. Suppose, with his aid, you studied accounting principles and solved problems day by day—easy ones at first—then the more difficult ones. If you could do this—and if you could turn to him for advice as the problems became complex—soon you'd master them all.

That's the training you follow in principle under the LaSalle Problem Method.

You cover accountancy from the basic Elements right up to Accountancy Systems. Later, you choose from twelve post-graduate electives, including C. P. A. coaching.

As you go along, you absorb the principles of Auditing, Cost Accounting, Business Law, Organization, Management and Finance.

Your progress is as speedy as you care to make it—depending on your own eagerness to learn and the time you spend in study.

Will recognition come? The only answer, as you know, is that success *does* come to the man who is really *trained*. It's possible your employers will notice your improvement in a very few weeks or months. Indeed, many LaSalle graduates have paid for their training—with increased earnings—before they have completed it! For accountants, who are trained in organization and management, are the executives of the future.

### Write For This Free Book

For your own good, don't put off investigation of *all* the facts. Write for our free 48-page book, "Accountancy, The Profession That Pays." It'll prove that accountancy offers brilliant futures to those who aren't afraid of serious home study. Send us the coupon *now*.

Over 1700 Certified  
Public Accountants among  
LaSalle alumni

4101 S. Michigan Ave., Dept. 183-HR, Chicago, Ill.

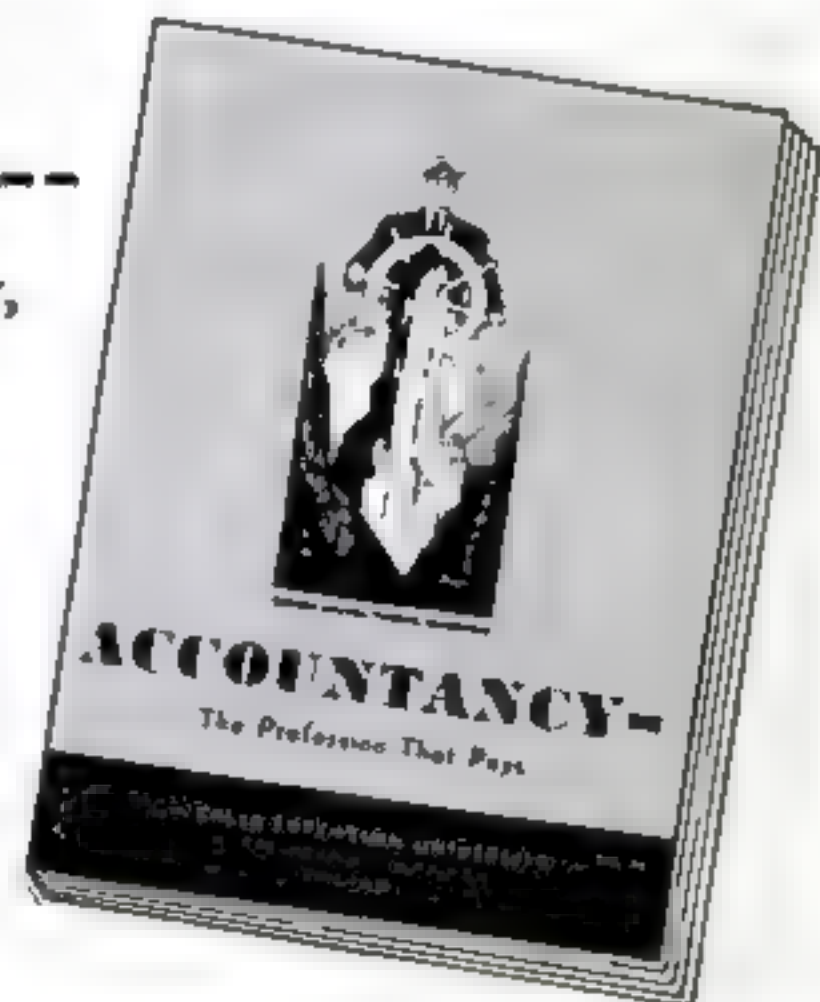
I want to be an accountant. Send me, without cost or obligation, the 48-page book, "Accountancy, The Profession That Pays," and full information about your accountancy training program.

Name \_\_\_\_\_

Address \_\_\_\_\_ City \_\_\_\_\_

Position \_\_\_\_\_ Age \_\_\_\_\_

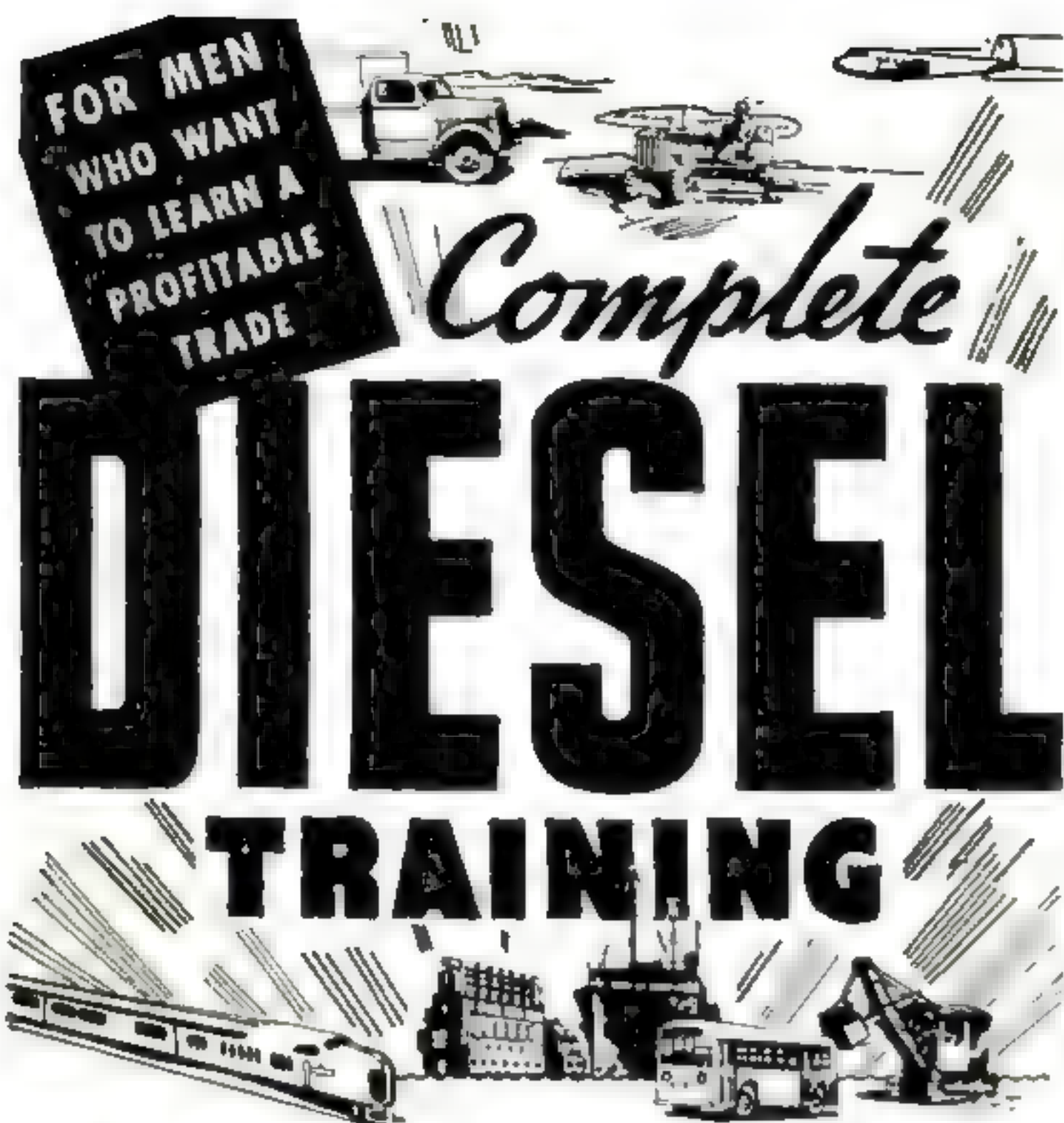
**LASALLE EXTENSION UNIVERSITY**  
A CORRESPONDENCE INSTITUTION





FOR MEN  
WHO WANT  
TO LEARN A  
PROFITABLE  
TRADE

# Complete DIESEL TRAINING



**NO MATTER WHERE YOU ARE  
OR WHAT YOU DO**

**—we have a training plan for YOU!**

IF you are sincerely ambitious and interested in making good in the Diesel field, be sure to immediately investigate our flexible training plan that will fit your circumstances. A Plan for every Man. A Plan for those seeking immediate shop training as well as for those who cannot give up their present employment and income. For 33 years National Schools, a recognized leader in the field of trade education, has helped wide-awake men to success. This million-dollar trade school will supply you with a sincere, honest statement of facts of what you should do to quickly get into the profitable Diesel Industry. No exaggerations—no misstatements; and a definite plan to fit you.

**Write Today  
For Full Details**

Mail the coupon below. Find out how you can get the finest in Diesel training without delay. See how this great trade school operates and makes its facilities available to every ambitious man. Actual work in modern training shops, a part of every man's instruction. Shop methods time-tested for 33 years. Fascinating efficient preparation. Get the facts.

**WE ARE DEFINITELY INTERESTED IN HELPING MEN OF LIMITED INCOME AND "BLIND ALLEY" JOB HOLDERS.**

**NATIONAL SCHOOLS**



**FREE  
BOOK**

*Los  
Angeles*

*Request for Free Book*

NATIONAL SCHOOLS (established 1905) Dept. 1-PSA  
4000 South Figueroa Street, Los Angeles

Please send me, without obligation, your FREE BOOK and information regarding Diesel Employment Opportunities and Requirements.

NAME \_\_\_\_\_ AGE \_\_\_\_\_

ADDRESS \_\_\_\_\_ CITY \_\_\_\_\_ STATE \_\_\_\_\_

*(Continued from page 22)*

central fulcrum, the pedal has an accelerator-actuating arm extending down from the toe of the pedal, and a brake-actuating arm from



the heel. The operator presses the pedal with the front part of his foot to control the accelerator and with the back to control the brake. A spring under the back end of the pedal keeps the brake-accelerator at a neutral position when no pressure is being applied on it. . .

WHEN TWO PEOPLE

are sleeping in the same room, the clanging alarm clock that wakens one person in the morning is bound to wake the other also, even though he may want to sleep late. One recent invention provides a solution to this difficulty in a silent-alarm wrist watch.

A special spring attachment pricks the wearer's wrist to waken him at a desired time. . . PATENT TITLES are usually phrased simply, as "Brush," or "Receptacle," or "Lock." When chemists patent new formulas, however, titles often hit the opposite extreme. Take patent



2,132,388, for example—"Aliphatic Acid Diamide of Long Chain Aliphatic Diamides." Or try the title of number 2,131,144 on your vocal cords—"Hexamethylenetetramine N Bismuth Iodide." . . . NO CONNECTING CORDS

are necessary with a "wireless" flatiron perfected by Harry F. Waters, of New York City. High-frequency current surges through a coil mounted on the underside of an ironing board made of an insulating material. Current passes by induction through the ironing board to power the heating element within the iron resting on the top surface of the



board. . . A TINY PROPELLER in the nose of a new type of aerial bomb devised by Harold M. Brayton, of Westfield, N. J., actuates the bomb's fuse mechanism. Auto-

*(Continued on page 26)*



# MYSTERIOUS DEVICE

ENABLES

ANYONE TO

## WELD BRAZE AND SOLDER



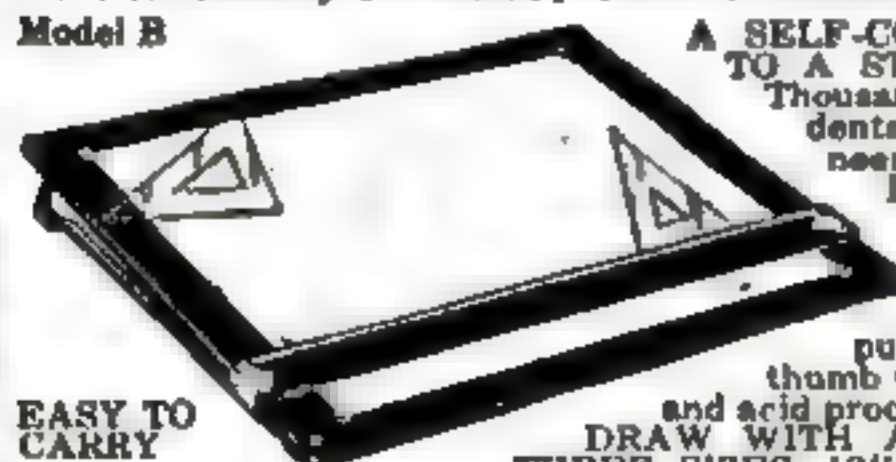
Now, an electric welding, brazing and soldering Torch, complete with power unit, goggles and supplies. Works instantly off ANY Light socket. Does a thousand and one repair jobs at amazingly Low Cost on aluminum, iron, steel and other metals. Indispensable for Auto, Fender and Body Repairs, and home repairs—shop, factory, farm, engineer, janitor, sheet metal, radio and bicycle repairs. Anyone can handle without previous experience with our simple instructions.

**10-DAY HOME TRIAL**  
Write At Once for Special Introductory Low Price Offer. You can try 3 in 1 Electric Torch for 10 Days at our risk, or get one absolutely Free by helping us to introduce it. Write **ELECTRO-TORCH CO.** 2613-BZ Michigan Ave. Chicago

## NEW MODEL DRAW-O-MATIC DRAWING BOARD

ATTACHED, SLIDING, SELF-ALIGNING, PARALLEL-BAR

Model B



A SELF-CONTAINED UNIT BUILT TO A STANDARD OF QUALITY. Thousands in use by Draftsmen, Students, Architects, Artists, Engineers, Designers and Executives. Hard composition board stays flat. Light weight. Bar slides accurately and easily. Patent CROSS-STRUNG bronze cable and pulley give accurate action. No thumb tacks necessary. Water, oil and acid proof. ENABLES ANYONE TO DRAW WITH ACCURACY AND SPEED.

THREE SIZES: 12"x16" \$2.95, 16"x20" \$3.95, 20"x25" \$4.95 plus postage. Other models with transparent celluloid straight-edge described in FREE CIRCULAR. WRITE TODAY.

ROLLIN INSTRUMENT CO. Inc., Dept. P.S. 19, 216 No. Clinton St., Chicago, Ill.



## "BECOME A LIGHTNING TRICK CARTOONIST"

Make money Chalk Talking. Send \$1.00 for Laugh Producing Program. Illustrated catalog 10c. BALDA ART SERVICE, Dept. 4-E, Oshkosh, Wis.

SPEAK

## FRENCH • SPANISH • GERMAN

or any of 23 languages in 3 months of pleasant spare-time study in your own home by the quick, easy Linguaphone Method. First you listen, then you speak. Send for FREE book.

Linguaphone Institute, 22X Rockefeller Center, N. Y.

## JOBS in RADIO-TELEVISION

Extension and resident training in television, aviation and police radio. Let us tell you how we train men, fit them for good jobs, help them get jobs. Write for catalog. Affiliated with KMBC, major network station. Address MIDLAND TELEVISION, Inc., 104-A Power & Light Bldg. Kansas City, Mo.

## FAILURE?

Are you discouraged, bewildered, seeing others forge ahead to success, wealth, power while you remain in the ranks? Do you ever ask what it is that makes them successful where you fail, when they have no more intelligence than you? Don't give up. . . . I can help you! Send your name and address to G. Mangin, Pershing Square Bldg., New Rochelle, N. Y.

## Correspondence Courses in RADIO and ELECTRICAL ENGINEERING \$25

**ELECTRICAL ENGINEERING.** Get good grasp of wide electrical field. Modern. Very understandable.

**RADIO ENGINEERING.** Extra fine course in radio, public address, photo-electric work. Trains you to be super-service man, real vacuum tube technician. Tuition ONLY \$25, either course. Deferred payment plan. Experiment kits furnished.

**FREE** Write for free copies of school catalogs, student magazines, etc.

**LINCOLN ENGINEERING SCHOOL, Box 931-51, Lincoln, Nebr.**



**RADIOS  
JOKES  
CURIOS  
ANIMALS  
BOOKS  
MAGIC  
RINGS  
SEEDS**

6000  
AMAZING  
NOVELTIES,  
SCIENTIFIC  
ARTICLES,  
ETC.

Rush 3c for our gigantic catalog of 6000 unusual and amazing novelties, cameras, radios, electrical articles, live animals, joke goods, books, magic, seeds, punchboards, stamps, rifles, watches, etc., etc. Deluxe Cloth bound catalog, 25c. Johnson Smith & Company, Dept. 140, Detroit, Michigan



## High School Course at Home

### Many Finish in 2 Years

You can complete this simplified High School Course as rapidly as your time and abilities permit. Equivalent to resident school work—prepares you for entrance to college. Standard H. S. texts supplied—Diploma. Credit for H. S. subjects already completed. Single subjects if desired. High School education is very important for advancement in business and industry and socially.

### College Entrance

During the past 14 years, our High School graduates have been admitted to 531 different Universities, Colleges, Junior Colleges and Normal Schools—80% of them without entrance examination. Course also prepares for teachers' certificate and pre-professional examinations.

### Business—Industry

To get and hold a good position in Business today you must be able to write clear, accurate letters and reports—do figuring involving Algebra and Geometry—talk intelligently on matters requiring a knowledge of Geography, History, and Economics.

In Industry—Mechanical and Engineering lines—you must have at least an elementary knowledge of Physics and Chemistry—be able to figure quickly and accurately—know something of Mechanical Drawing and blueprints—and be able to talk and write accurately and clearly on both your work and ordinary topics of conversation.

Our High School course meets the preparatory educational requirements for Business and Industry.

### An Educational Institution

The American School was chartered in 1897 as an educational institution, not for profit—and is exempt from paying Federal income tax, like the best resident colleges and universities.

### Don't Be Handicapped—Complete Your Training Now

Be a High School Graduate! Prepare yourself for promotion in Business and Industry—for the Professions, College Entrance and social success. No matter what line you may select, High School training will prove invaluable to you! Our moderate fees cover all instruction, standard textbooks and Diploma. Easy monthly terms. Get ahead in life. Start your training NOW!

### 20 Other Courses

Over 150 noted Educators, Engineers, and Business Men helped prepare our special instruction material, which is used by many resident schools and colleges, U. S. Navy, and Province of Manitoba, Canada. We offer you quality training at home for the best-paying lines of Industry and Business, as listed in the coupon.

Our moderate fees cover all instruction, standard textbooks and Diploma. Easy monthly terms. Get ahead in life. Start your training NOW!

Mail coupon for information about line that interests you  
**American School, Drexel at 58th, Chicago**

**American School, Dept. H-146, Drexel at 58th, Chicago**

Tell me how to train for success in line checked. No obligation.

☐ High School Course

- |  |  |
|--|--|
| <input type="checkbox"/> Accounting & Auditing   | <input type="checkbox"/> Diesel Engineering    |
| <input type="checkbox"/> Architecture & B'ldg    | <input type="checkbox"/> Drafting & Design     |
| <input type="checkbox"/> Automotive Engin'ring   | <input type="checkbox"/> Liberal Arts          |
| <input type="checkbox"/> Business Management     | <input type="checkbox"/> Private Secretary     |
| <input type="checkbox"/> Commercial Aeronautics  | <input type="checkbox"/> H'ier Ac't'g (C.P.A.) |
| <input type="checkbox"/> Electrical Engineering  | <input type="checkbox"/> Highway Engin'g       |
| <input type="checkbox"/> Electrical Refrigerat'n | <input type="checkbox"/> Mechanical Eng'r'g    |
| <input type="checkbox"/> Air Conditioning        | <input type="checkbox"/> Radio & Television    |
| <input type="checkbox"/> Civil Engineering       | <input type="checkbox"/> Salesmanship          |
| <input type="checkbox"/> Complete Law            | <input type="checkbox"/> Steam Engineering     |

Name .....

Address .....



# ACCOUNTANTS!

**Step 10 years ahead  
at once in accounting experience**

with this famous 1742-page handbook of latest expert practice, from simple bookkeeping to higher accounting. Helps you display kind of skill that wins recognition and advancement; saves time, increases your ability to handle new problems, modern conditions. Guides you in any situation, everyday or emergency. Records, systems, working procedures; statements and reports; analysis; comparisons; planning and budgets; auditing and internal check—rules and definitions; hundreds of useful forms—31 big sections, complete in one handy volume, the

## ACCOUNTANTS' HANDBOOK

Nothing else like it. Widely used by executives, credit men, bankers—over 150,000 bought. Editorial Board of 70 experts. Contents would fill 10 big books, usual style.

Sent for 5 days' trial—you risk nothing; no advance payment. Monthly payments if you wish.

### Special Offer for Limited Time Only:

If you order the Handbook now, we will send with it a handsome Vest-Pocket Memo-Diary Book for 1939 containing also pages for your personal data, income and expense records, etc. This is yours to keep without additional charge; if you retain the Handbook.



\$7.50—see offer

Mail This Approval Form

**THE RONALD PRESS COMPANY, Dept. M-274**  
15 East 26th Street, New York, N. Y.

Send me, as offered, the Accountants' Handbook, together with the vest-pocket memo diary. Within 5 days after their receipt, I will send you \$7.50 (plus a few cents delivery) in payment for the Handbook alone, or return both books to you.

☐ Check here if you prefer to pay for the Handbook in 5 monthly payments of \$1.50 each.

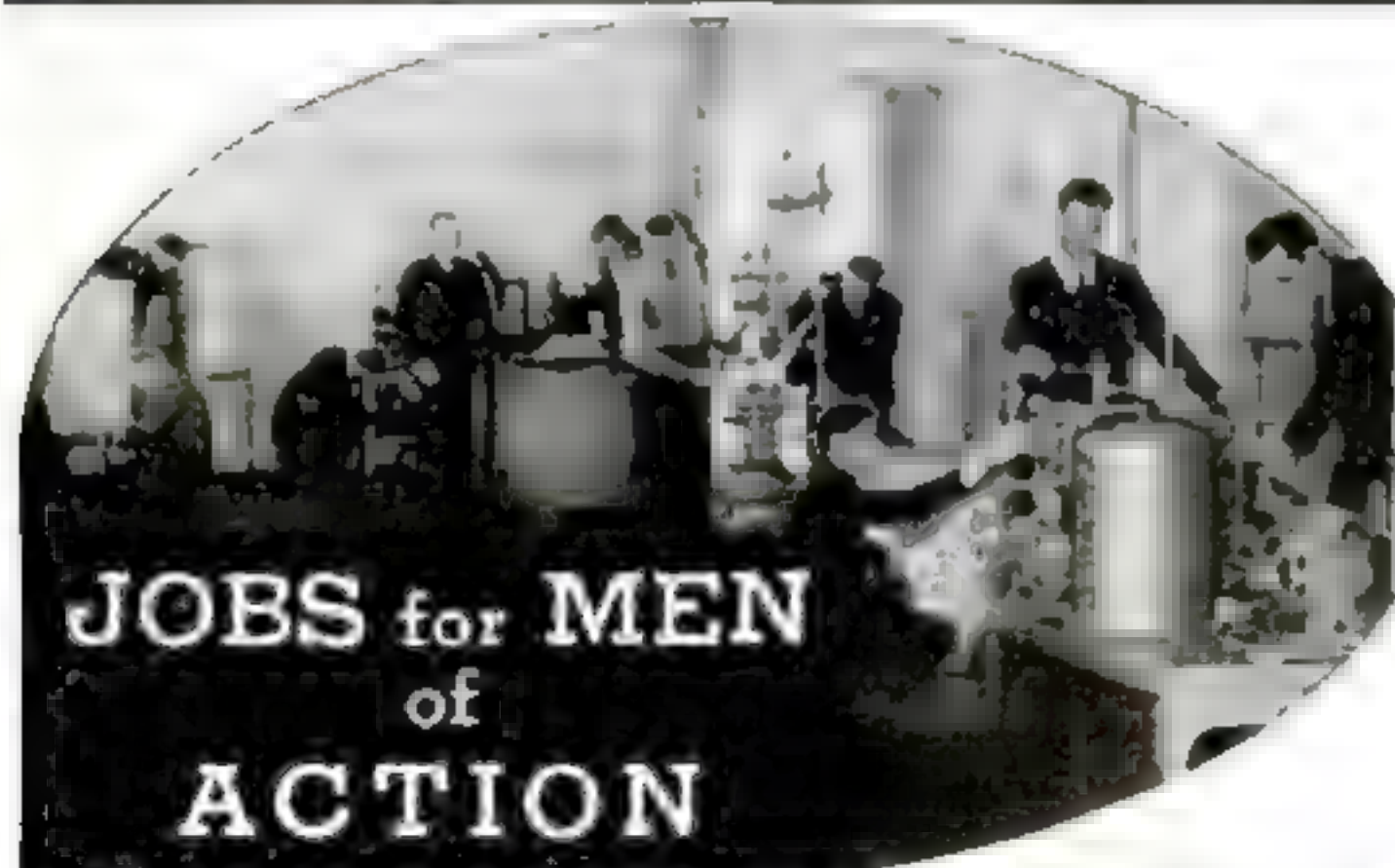
Name (please print) .....

Firm ..... Position .....

Business Address .....

City ..... State .....

We pay delivery if you send cash; same return privilege



**U. S. Industries** demand young men with combined technical commercial and real practical training.

### CHOOSE YOUR OWN PLACE IN

Air Conditioning for Homes, or Commercial Installation and Service, Ventilating, Dairy Refrigeration, Transport Refrigeration, Sales, Research, or Executive Position.

**35 YEAR OLD ORGANIZATION** Now receiving applications of men to prepare for good paying positions. No experience needed. We train you under actual working conditions. Every student given individual instruction in immense laboratories on 20th

Century Air Conditioned Test Home. Co-operative Part-time work Plan. Earnest men of high character assisted to earn part expenses. Student Loans. Moderate training fee. Few industrial Scholarships awarded to men of outstanding merit. Don't be content with ordinary work and low pay when in a short time you can become a thoroughly trained Specialist in Air Conditioning.

### GET FREE BOOK



For details write  
O. Werwath, President.

**MILWAUKEE  
SCHOOL OF ENGINEERING**  
Dept. P. S. 139A  
Broadway and East State  
Milwaukee, Wis.

## MILWAUKEE SCHOOL of ENGINEERING

Institute of Electrotechnics

Without obligation send free booklet "Step Up to Success." Also tell me how I can become an Air Conditioning and Refrigeration Specialist in 3 mos. .... Air Conditioning Engineer (1 yr) .... Send details of Student Loan .... Industrial Scholarship .... Earn Part Expense ....

Name ..... Age .....

City ..... State .....

If interested in other courses, check here:

Electric Arc Welding Operator (3 1/2 mos) ....

Welding Technician (4 mos) ....

Welding Engineer (1 yr) ....

Radio and Television Serviceman (6 mos) ....

Commercial Radio Engineer (1 yr) ....

Electrical Engineer (B.S. degree—4 yrs) ....

P.S. 139A

(Continued from page 24)

matically going into operation the instant the bomb is released from a plane, the whirling propeller gradually turns a screw



that brings the firing pin into position for detonating the bomb charge on contact with any object. Present fuse mechanisms for this purpose, Brayton states, are practical but very complicated and expensive to produce, . . . A SHAVING BRUSH that produces its own hot water for working up a rich lather, is the invention of William G. Frazier, of Philadelphia, Pa. The base of the brush handle houses a tiny, chemically fueled furnace to heat water in a small reservoir immediately above. The hot water then

seeps through the brush bristles. A thermostatic unit shuts off the heater when the water reaches a specific temperature. . . THE DEMAND for copies of patents on file in Washington, D. C. runs to about 7,000,000 a year.

... ANOTHER BATHROOM ACCESSORY is a combined grab rail and seat for bathtubs, devised by George B. Bentz, of New York City. The seat and rail are attached to U-shape clamps that straddle the side wall of the tub. The unit is collapsible for compact storage when not in use. . . PROPER FITTING of gas masks to civilians during the recent war scare in Europe caused much worry and official gnashing of teeth. Two workers at



the Edgewood Arsenal, Edgewood, Md., believe they have a solution to this problem in a universal gas-mask face piece said to fit faces of all sizes and shapes. It differs from present types in the special shape of the blank from which it is molded. The mask is covered by a special patent that makes it available to



the U. S. Government without payment of royalty. . . ONE HUNDRED AND ELEVEN patents granted to one inventor at the same time—

(Continued on page 28)



# FOOD DISTRIBUTORS WANTED!

**MAKE UP TO \$60.00 IN A WEEK**

If you are out of work or on part time and need cash at once to pay your bills and live on, you are just the person I am looking for. Send your name at once for complete free facts about my plan. I have an unusual offer for you right now—a wonderful chance to start right in making up to \$10.00 in a day.

**WITH MY PROVEN PLANS**

**EARNINGS START AT ONCE**

Wonderful Food Distributor Plan making a tremendous "hit" throughout the nation. I must appoint more men and women at once. Don't delay. Send for complete details now—no cost or obligation. Start at once to make

**\$96.00 IN ONE WEEK**

I wish you could see the marvelous reports I receive from dealers. Clare C. Wellman, N. J., reported \$96.00 clear profits in one week; Wilbur Whitcomb, Ohio, \$146; Lambert Will-

money according to simple, proved plan. Distribute circulars, pick up orders, pocket a big part of every dollar you take in. Producers are given brand-new latest model Ford Tudor Sedans as a bonus in addition to cash earnings.

son, Mich., \$79.00; Gunson R. Wood, N. Y., \$82.10; Mrs. Ella Ehrlicher, Mo., \$85.00. These exceptional earnings show your big possibilities.

**I SEND EVERYTHING**

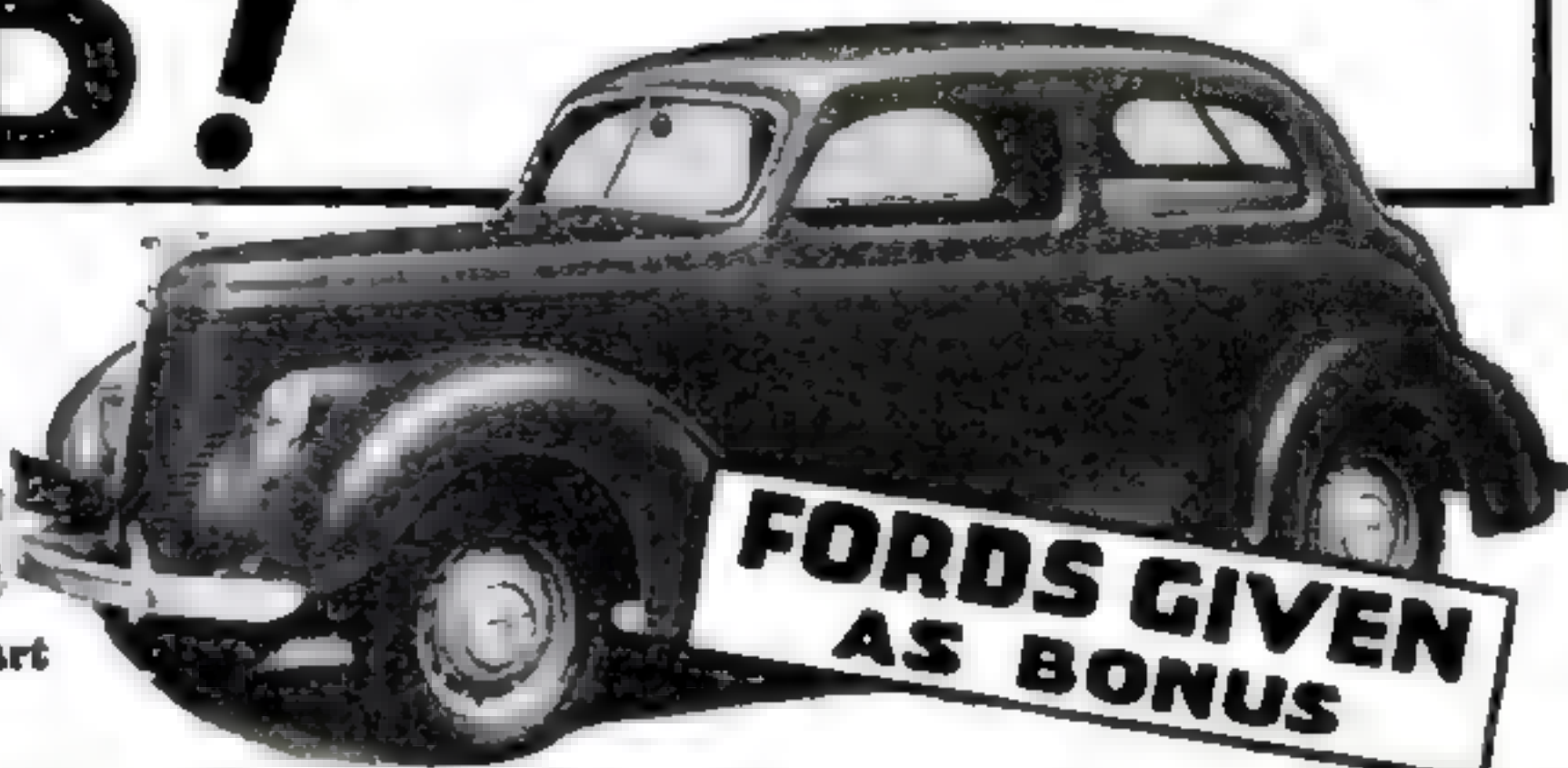
Previous experience not necessary. I send you positively everything you need to make good money your very first day. But you must act fast. Simply send your name and address on the coupon or on a penny postcard. By return mail I'll rush to

you the complete marvelous facts about this astoundingly simple cash producing idea. Won't cost you a penny. You decide if the earning possibilities are big enough for you. You have everything to gain. Send coupon or penny postcard at once.

**ALBERT MILLS, Pres.**

9232 Monmouth Ave.

Cincinnati, Ohio



**FORDS GIVEN AS BONUS**



**STARTED PENNILESS** 6 Months Later Worth \$1200.00

"Only 6½ months ago I started with your organization without a penny to my name, and today (I just finished my balance) I am worth a little more than \$1,200.00. I can hardly believe it possible—such a success in so short a time."

Hans Coordes, Nebraska

**Free Offer COUPON**

ALBERT MILLS, President  
9232 Monmouth Ave., Cincinnati, Ohio

Rush me your marvelous Food Distributor plan—free and without obligation. Tell me how to make good money at once and get a new Ford car as bonus.

Name.....

Address.....

(Please Print or Write Plainly)

**Boys! Look! — A Real XMAS gift for YOU!**



Get the big special Landon Picture Chart Course of Cartooning—prepared especially for boys. Features same method that has given right start to hundreds of successful cartoonists. 75 big charts, over 1000 explanatory illustrations. Complete set of all needed Drawing Materials included. Available quantity limited—ACT QUICK! Postpaid anywhere in U. S. upon receipt of name, address and check, money order, or cash—for only **\$2.98** Literature on request.

THE LANDON SCHOOL, 1225 National Bldg., Cleveland, O.

**AIR CONDITIONING AND REFRIGERATION TRIAL LESSON**

Trained men needed. Good pay. Opportunities. Learn easily AT HOME in spare time (or at our Chicago School). Send for **FREE TRIAL LESSON**. No charge for this now or later. Write today.

CHICAGO TECHNICAL COLLEGE

A-332 Tech Bldg., 118 E. 26th St., Chicago, Ill.

**MONEY for Talent!**

**BECOME A PROFESSIONAL ARTIST**

If you have drawing talent, a large salary or a profitable business of your own can soon be yours. Learn commercial art at home through America's oldest and finest school. Forty years of successful teaching proves our ability. Write today for ART YEAR BOOK and full details. No obligation.

SCHOOL OF APPLIED ART

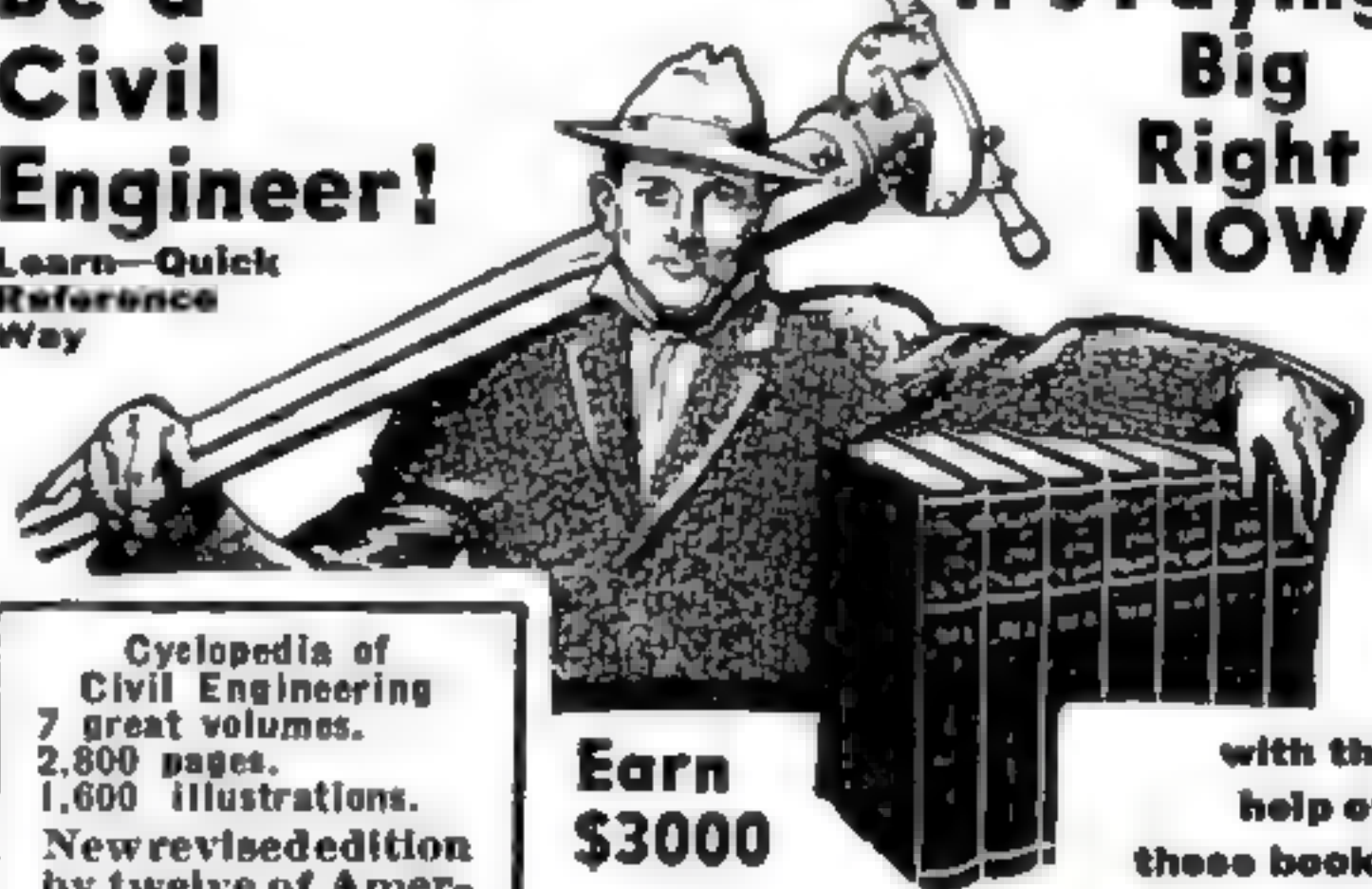
Dept. 319 10 E. Huron Street Chicago, Ill.

**BIG MONEY from POULTRY**

I show you how to increase profits, or start your own business. I train you at home in spare time. My homestudy course will show you the latest methods and give you facts that can be worth money to you, or to an employer already established in some branch of the poultry business. My 32-page book, "How to Raise Poultry for Profit" fully explains the opportunities in this fascinating field. Shows how others are cashing in. Write for a copy today. Harry M. Lamon, Pres., National Poultry Institute, Dept. 204-E, Adams Center, New York.

**Be a Civil Engineer!**

Learn—Quick Reference Way



**It's Paying Big Right NOW**

**Earn \$3000**

with the help of these books

**a Year—and Up!**

"Civil engineers are wanted NOW. Enormous amounts are being spent in all kinds of public works and not a dime is spent until the Engineer has prepared plans. Then He must direct the work. It's a big job and there are not enough men to go around. Everywhere you go, you see road work going on—water and sewer systems being built—vast projects of all kinds. Here is Your Opportunity to get the necessary training right at home. These books are complete and simply written so anyone can understand them. Start now on our **FREE** examination plan. Mail the coupon without obligation."

AMERICAN TECHNICAL SOCIETY  
Dept. C120 Drexel at 58th St. Chicago

American Technical Society  
Drexel at 58th St., Dept. C120, Chicago  
I want to examine the CIVIL ENGINEERING Cyclopaedia for 10 days. I will gladly pay the few cents express, but I am to pay nothing for the 7 big volumes if I return them within 10 days. If I wish to keep them I will send you \$2 after the 10 days, then \$3 a month until advertising price, \$29.80 is paid. Send latest Edition and Slide Rule.

Name.....

Address.....

(Attach letter stating age, occupation, employer's name and address and that of at least one business man as reference.)

Cyclopaedia of Civil Engineering  
7 great volumes.  
2,800 pages.  
1,600 illustrations.

New revised edition by twelve of America's greatest engineers.

Includes: Surveying, bridges, railroads, steel structures, municipal engineering, water supply, road building, etc.

Spanish Grain Flexible Covers Gold Stamped

**Shipped Free**

For Examination



**Slide Rule**

Be prompt and we will include a brand new, circular slide rule to carry in coat pocket. Invaluable in solving all kinds of engineering problems.

Please mention POPULAR SCIENCE when writing to advertisers.



# Be An ARTIST!



## LEARN TO DRAW

—at home in your spare time

The fascinating field of Art offers opportunity to both men and women. Trained Artists are capable of earning \$30, \$50, \$75 a week. We teach you right at home for a successful career in—

### COMMERCIAL ART ILLUSTRATING CARTOONING

For 23 years W. S. A. graduates have been "making good" in Art—YOU CAN, TOO! No previous Art experience necessary—our instruction is practical and thorough. Write for Booklet—"Art for Pleasure and Profit," fully describes course and TWO BIG ARTISTS' OUTFITS given. Clip coupon—mail today.

### FREE BOOK gives details!

Washington School of Art, Studio 131M  
1115—15th St., N. W., Washington, D. C.

Yes! I am interested in learning to draw. Please send me your Free Book, "Art for Pleasure and Profit."

Name \_\_\_\_\_ Age \_\_\_\_\_

Address \_\_\_\_\_

City \_\_\_\_\_ State \_\_\_\_\_

## Radio in 12 WEEKS

I WILL  
FINANCE YOUR TRAINING  
IF YOU ARE SHORT OF MONEY

Prepare for opportunities in Radio Broadcast, Talking pictures, Television, by 12 weeks of practical shop work in the great Coyne Radio Shops, on real RADIO and Sound equipment. You don't need advanced education or experience. Free Employment Service for life. Many earn while learning. Electric Refrigeration included. Mail coupon today for free book which tells you how hundreds have become successful RadioMen after taking our training. H. C. LEWIS, Pres., RADIO DIV., Coyne Electrical School 500 S. Paulina St., Dept. 19-4H, Chicago, Illinois. Send Free Radio Book and facts. Tell me about your "Pay-Tuition-After-Graduation" Plan.

NAME \_\_\_\_\_ AGE \_\_\_\_\_

ADDRESS \_\_\_\_\_

CITY \_\_\_\_\_ STATE \_\_\_\_\_

## How To Secure A Government Position

Why worry about strikes, layoffs, hard times? Train now for a Government job. Increased salaries, steady work, travel, good pay. Let us help you become a Railway Postal Clerk, Post Office Clerk, City Mail Carrier, Rural Carrier—help you get a position in Government Classified Service. I was a Civil Service Examiner for nearly 8 years. This coaching has helped thousands. Big illustrated book tells about Government jobs—and how our instruction helps to qualify you to get the one you want. Send for a free copy TODAY.

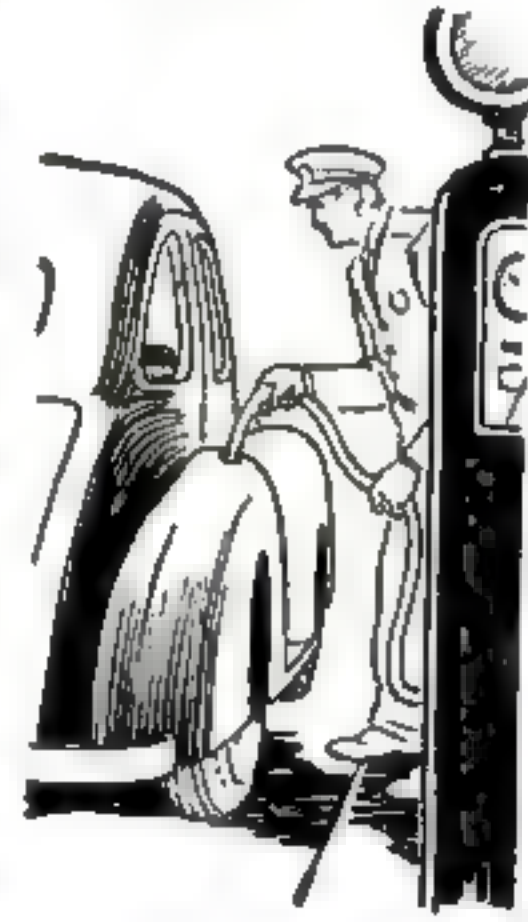
PATTERSON SCHOOL, Arthur R. Patterson, (Former Gov't. Examiner) Principal, 161 Mercantile Bldg., Rochester, N. Y. Send without obligation, free book "How to Secure a Government Position."

Name \_\_\_\_\_

Address \_\_\_\_\_

(Continued from page 26)

that's the record recently set up by Gustave Erhard, of Scranton, Pa. All were design patents relating to ornamental curtain patterns. Filing fees alone cost the inventor \$1,100. . . THE HENS probably won't like it much, but they will have to put up with an ingenious egg meter recently devised. The meter, strapped to the hen, registers the number of eggs an individual hen lays so that the owner of a large number of hens can keep track of the egg-laying efficiency of the occupants of his hen house. As each egg is laid, it touches a lever that registers the event on a meter on the hen's back. . . FRANCES W. DUNMORE, veteran radio engineer at the U. S. Bureau of Standards in Washington, D. C., contributed the basic ideas for a new automatic radio control designed to land an airplane with no help whatsoever from the pilot. The latter merely sets the controls as the plane nears an airport, and then sits back to let the automaton handle all details of the landing. The device, it is said, will regulate plane speed, make adjustments for cross winds, operate wing flaps and tail controls, and even apply wheel brakes to halt the plane at a definite spot on the landing field. . . GAS TANKS are incorporated into the rear fenders of an automobile in a design worked out by Brooks Walker, of Piedmont, Calif. This should leave more space for luggage and spare tire at the back of a car, but what happens if a road hog nips the rear fender? . . . PERHAPS this inventor and one who has just taken out a patent on a shockproof car should get together. The shockproof car is encircled by a thick, heavy, resilient rubber bumper which even covers the wheels. If a collision occurred with this type of car, there would be no crash, just a bounce, and a fender-mounted gasoline tank would be less susceptible to serious damage.



Please mention POPULAR SCIENCE when writing to advertisers.



# Classified Section

CLASSIFIED RATE—30c a word per insertion. Smallest Ad 10 words.

For FEBRUARY INSERTION copy and remittance must be in this office December 3rd.

POPULAR SCIENCE MONTHLY — 353 Fourth Avenue — NEW YORK, N. Y.

## ADVERTISING

**LEARN** Advertising quickly at home. Easy practical plan. No text books. Common school education sufficient. Interesting booklet and requirements free. Page-Davis School of Advertising, 3601 Michigan Avenue, Dept. 1741, Chicago.

**MAIL-ORDER** ad reaching 1,500,000 families throughout United States \$15.40 inch. Newspaper, magazine, ratebook free. Chicago Advertising Agency, 20-PS West Jackson, Chicago.

**ADVERTISE:** 24 words in 250 newspapers \$10. Lists free. Advertising Bureau, 4515-P Cottage Grove, Chicago.

**INCH** display advertisement 30 magazines year \$24. Wood's Popular Services, Atlantic City, (N. J.)

**45 WORDS** displayed 25 magazines, \$3.00. Goodall, 628 Montgomery, San Francisco.

## AGENTS WANTED

**DON'T** be a job hunter. Start your own business on our capital. No hard times; no lay-offs; always your own boss. Hundreds average \$3,000 to \$5,000 annual sales year after year. We supply stocks, equipment on credit. 200 home necessities. Selling experience unnecessary. Wonderful opportunity to own pleasant, dignified, profitable business backed by world-wide industry. Write Rawleigh's, Dept. A-U-PSC, Freeport, Ill.

**MYSTERY** Invention, carried in pocket, keeps hands, feet, ears, body warm on coldest days. Lasts years. Everybody buys, workmen, housewives, truckdrivers, schoolboys, farmers, spectators, others. Low priced, big profits. Reserve your territory now for big winter profits. Write quick. Kumfy Warmer, 4208 Davis Lane, Dept. S-2310, Cincinnati, O.

**SELL** sensational automobile accessory. Holds car on hill without use of foot or hand brake; frees right foot for gas; fits every make car; installed in five minutes. Our men earn \$50.00 to \$75.00 weekly. Protected territories. Small capital for stock required. Write for details. Everlast Manufacturing Co., 17 East 42nd Street, N.Y.C.

**NEED** Money Quick? Here's a genuine opportunity to make up to \$42.50 in a week. Operate grocery business from your own home. Supply friends, neighbors, others. I send complete outfit on 30-day trial; no money risk. Details free. Albert Mills, 3245 Monmouth, Cincinnati, Ohio.

**HOTELS, Hospitals, Taverns, etc.** buy amazing "Zis" Cleaning Powder by bag and barrelful. Profits from \$1.50 to \$4.00 per sale. Repeat orders sure. Our representatives make good money. Send stamp for sample and full details. Gensaco, 2044 Lincolnpark West, Chicago.

**WEAR** fine hose I send without cost with outfit while taking orders for amazing new hosiery. Replacement guaranteed against holes, snags, and runs. Rush name and hose size. Wilknit, Desk A-80, Greenfield, Ohio.

**LOCAL** Agents wanted to wear and demonstrate suits to friends. No canvassers. Up to \$12 in a day easy. Experience unnecessary. Valuable demonstrating equipment, actual samples free. Progress Tailoring, Dept. N-221, 500 Throop, Chicago.

**100% PROFIT** in new perfected (1938) quick-action self-starting cigar lighter. No flint or friction. No wind can blow it out. Retail 25c. Costs you \$1.75 dozen. Sample and can fluid 25c. New Method Co., Box PS-73, Bradford, Penna.

**REVOLUTIONARY** Window cleaning tool. Good Housekeeping approval. Only ten \$2.25 sales daily to housewives, factories, schools, stores will make you \$350.00 monthly. Carter Products Corp., 900 Front Ave., Cleveland, Ohio.

**300% PROFIT** selling gold leaf letters for store windows; free samples. Metallic Co., 437 North Clark, Chicago.

**BIG** Money applying initials on automobiles. Easiest thing today. Free Samples. Also, sideline salesmen for name plates and tire cover transfers. "Ralco," 1305 Washington, Boston, Mass.

**PROFIT** with new products. Make, sell, repeat. Analysis. Research. Guaranteed formulas. Biggest catalog free. Special prices, leads. Gibson Laboratory, Chemists, PB-1142 Sunnyside, Chicago.

**AT** home, your own manufacturing business, making popular \$1.00 novelties. Cost you 3c to 15c. Everything supplied. Write So-Lo Works, Dept. N-824, Cincinnati, Ohio.

**NEW** Discovery of Ancient Secret Cream Perfume. Sells on sight. Big Profits to Lady and Gentlemen Agents. Send for Samples. Persian Perfume Company, 1231 Olive, Desk 12, St. Louis.

**BEAUTIFUL** English Christmas Cards. Excellent Assortment, 21 in Holiday box. Retail Value \$2.25, Agent's Price 50c. Fast Seller. Gold Shield Products, 350-S Greenwich St., New York.

**STRANGE** Chemical Sponge cleans wallpaper like magic. Banishes housecleaning drudgery. Sensational demonstration. Samples sent on trial. Rush name. Kristee 101, Akron, Ohio.

**MILLIONS** of Prospects! Buyers Everywhere! Sensational Social Security Plates! Tremendous Value! Fast Seller! Big Profits! Complete Selling Outfit Free! Union Specialty, 1775-B Broadway, New York.

**500% PROFIT.** Modernistic guaranteed Stick-on letters for windows, Offices, Trucks. Large sizes 1c. Easily applied. Free samples. Modernistic, T-3000 Lincoln, Chicago.

**WHY** sell goods with stingy profits? Easily make today's newest profitable popular products yourself! Stamp brings valuable details telling how. Miller, Chemist, 1708-Ja Tampa, Fla.

**SELL** guaranteed tires wholesale. Save users up to 70%. No experience necessary. Profits easy. Unlimited field. Details free. Auto Tire Company, 4502 S. Ashland, Chicago.

**"ECONOMY Plus Power."** Supercharger: an engineering marvel. Slashes driving costs: \$18.00. Liberal discounts. Nil Mellor, Waldorf Astoria, New York. Send for booklet.

**MEXICAN** Gifts. Make large profits selling handmade articles. Sandals, textiles, pottery, etc. Send 15c for illustrated catalogue. C. Pease T., Apartado 8764, Mexico City.

**SUCCEED** with your products. Make-Sell them. Formulas. Processes. Accurate Analyses. Catalog free. P. Thaxly Company, Washington, D. C.

**BIG** money applying initials on automobiles. Write for particulars and free samples. American Letter Company, Dept. 47, Dunellen, N. J.

**FREE** sample—amazing cleaner; sells homes, taverns, everywhere Big profit—fast repeater. Besco, 5009-X, Irving Park, Chicago.

**AMAZING** invention. Pocket adding machine. Nationally advertised \$2.50. Whirlwind seller. Big profits. Calculator Co., Box 1118, Chicago.

**500% PROFIT** selling new "20-in-1" kitchen utensil. Retail 25c. Costs you \$1.00 a dozen or \$7.20 a gross. Sample 10c. New Method Co., PSM-73, Bradford, Pa.

**ATLAS** window sign letters. Large sizes, penny each. Beautiful free samples. Atlas, 7941-K Halsted, Chicago.

**PIPE** smokers: new device, eliminates ash-tray odor, wet heel, plugging, slugs, dime. Hazett, 701 Fourth, Baycity, Mich.

**EXCLUSIVE** representatives appointed. Faucet water softener. Revolutionary. Luxsoft, Sausalito, Calif.

**500% PROFIT** with new perfected (1938) quick-action, no flint, automatic gas lighter. Retail 25c. Sample 10c. New Method Co., Box PS-73, Bradford, Pa.

**AGENTS:** Opportunity make money; book containing 107 successful business plans; home-office; send for free introductory booklet. Elite Co., 214-A Grand St., N. Y.

**BUSINESS** Proposition Resilvering Mirrors, Autoparts, Reflectors, Making Chipped Glass Signs. Write Sprinkle, Plater, 910, Marion, Ind.

**"SCRAPE-ZIT"** Distributors Wanted, new Utility tool for home, merchant, office and motorist. Sample \$1.00. Fred M. Giddings, Galesburg, Ill.

**205** MONEYMAKING Opportunities, today's conditions. Your own business, home, office, etc. Introductory booklet free. Stamforde, 3762-K Broadway, New York.

**LORD'S** Prayer, Ten Commandments on a Penny. Carded. Sells on sight; \$4.50 gross. Samples 50c dozen. Perkins, 1104 Lawrence, Chicago.

**500% PROFIT!** Gold and colored sign letters for windows, offices, trucks, signs. Monograms. Easily applied. Neonite, Akron, Ohio.

**"KEENEREDGER"** Produced 800 Smooth shaves from one blade. \$1.00 postpaid. Keeneredger, Oblong, Ill.

**AIR-Vacuum** Cleans Automobiles. Sells \$7.85, superior to many \$50.00 Cleaners. Mrs., Beeman Co., Denver, Colo.

**SUSPENDERS** 10c gross lots. Sample 25c. 6 pair \$1.00. Kes-Sel, 309 South 4th Street, Brooklyn, N. Y.

**MEXICAN** novelties! 100%-300% profit! Free particulars. Samples 10c stamps. Marquez-IC, Apartado 1178, Mexico City.

**JO-BO** Rubber bow neckties. To show them is to sell them. Good sideline. Jo-Bo Products Co., 3402 School, Des Moines, Ia.

**ENGRAVED** Name plates, numbers, signs, etc., profits large. Brett Bros., Elmwood Ave., Winthrop, Mass.

**HOLDS-UM** Cement. You'll like it. Small can 15c. "100 uses," free. Holds-um, Royal Oak, Mich.

**AFTERNOONS** Free! \$300 month—home! No canv. Expect surprise! Folios-B, Station D, Los Angeles.

**\$50 WEEKLY** calling on stores. No selling, just deliver—collect. Drexel Sales, Box 97, Drexel Hill, Pa.

**\$150.00 MONTHLY** handling new novelties spare time. Details. Bay Stamping, West DePere, Wis.

**MAKE** products yourself. Formula Catalog Free! Kemixo, 180-N Parkridge, Ill.

## AIR CONDITIONING

**AIR-CONDITIONING** Outfits; easily built! Home, work-shop, stores, offices! Enjoy "mountain air," year-around health and comfort. Complete instructions. Seven different blueprints. Send \$1.00. Money-back guarantee. Servatex Company, 850-PSM Madison Building, Milwaukee, Wisc.

## ANTIQUES, RELICS INDIAN GOODS

**100** GOOD ancient arrowheads \$3.00; Tomahawk head 50c. Flint knife 25c. Illustrated catalog 5c. H. Daniel, Hot Springs, Ark.

**ANCIENT** Relics; Arrows, spears, Axes, 10 different relics, 50c. 25, \$1.00. Illustrated catalog and arrow 6c. Brown, 5430 Hutchinson, Chicago.

**THOUSANDS** Of Pieces Old Glass. General line Antiques. Write wants. Glass list for stamps. Mrs. Don Hoover, 505 North 8th St., Quincy, Ill.

**MAKE** Your Own Indian Arrowheads. Illustrated booklet "How To Make Arrowheads" of flint, glass & etc. \$1.00. Indian Lore Publications, Green River, Wyo.



**12 ARROWHEADS**, Spearhead, Pipestone \$99, 4,000 Bargains, Relics, Antiques, Firearms. Beautiful catalogue 10c. Museum, Rutland, Ill.

**INDIAN Relics**: Arrows, spears, axes, banners, Glen Groves, 6601 Oshkosh, Chicago, Ill.

**100 GOOD**, or 60 fine, arrowheads, \$3.00. Catalog. George Holder, Glenwood, Ark.

#### AUTHORS' SERVICE

**WANTED** original poems, songs, for immediate consideration. Send poems to Columbian Music Publishers Ltd., Dept. 96W, Toronto, Can.

**SONGS**, Poems, bought composed published. Royalty. Free advice. Metro-Melody Music Publishers, San Francisco.

**ANYONE** can write stories, articles, plays. Details free. Fredericks, 944 Eighth Ave., New York.

**SHORT** stories and novels revised, type-written, marketed. Details free. Hursh Service, Box S-1013, Harrisburg, Pa.

#### AUTOMOBILES

**\$1.00 FOR** complete instructions for building model A-B-V8 Ford or Chevrolet Racing Car by the famous automotive engineer. Robert M. Roof, Engineering Dept., Anderson, Ind.

**MIDGET** autos! Plans, parts, kits. Catalog-handbook, 10c. Latest lists 100 used motors, midgets, parts, 20c. Details free. Shipps Midgets, Box 543-K, Zanesville, Ohio.

**COMPLETE** instructions for building and operating an inexpensive AC arc welder and a spot welder; 12-page illustrated booklet; only 50c, postpaid. Eugene Watson, Dept. C19, 353-4th Ave., New York.

**STOP** signaling by hand. Modernize your car. Make electric, theft proof turnsignal. Materials, directions \$1.50, plus postage. Empire Signal Co., B321, Jamaica, N.Y.

**FORD V-8's**, 1934-1938; gasoline saving device \$1.00. Walert Co., 3429 N. 10th St., Milwaukee, Wis.

**RACE** Car, Miller eight, Winner Indianapolis 500 mile race. Raced this year. H. Kohlert, St. Charles, Ill.

**R & R Mfg. Co.**, Anderson, Ind. Racing cars, midgets and speed equipment. Catalogue 25c.

**PHOTOGRAPHS**, Finest, Foreign, Domestic automobiles. Handbook 10c. Automobiles, Box 534, Saint Cloud, Minn.

**BUILD** Fast pumping air compressor from automobile motor. Instructions \$1.00. Tuck's Garage, 73 Shirley, Pontiac, Mich.

#### AUTO SUPPLIES & EQUIPMENT

**BE** First. Positive Outstanding Summer Starting in Winter Pays. Practical plans, technique, expert instructions on good starting without "gadgets." Comments on "gadgets." The latest device "Starting Ignition." How it is built, avoids timer troubles and gets  $\frac{3}{4}$  in. blue white starting sparks. This information cost \$9,000. Yours for \$1.00 with illustrations and working drawings, etc. Weston Laboratory, Eglinburgh, Ont.

**CONVERT** your car to burn Diesel oil. Save up to 70% fuel costs. Cheap installation. Wonderful performance. Proven factory method. Different and better. Costs nothing to investigate. Write for free circular No. 3. Harrington Company, 201-204 Manchester Bldg., Portland, Ore.

**NEW** book shows how to make any ship model. Short cuts, kinks, plans. 100 illustrations, only \$1.00 postpaid. Eugene Watson, Dept. C-19, 353-4th Ave., New York.

**ANY** Part or Accessory for your car at wholesale. Send stamp. Box 446, Cedar Rapids, Ia.

**FORD** Marine Conversions. Catalog 10c. Lehman Engineering Co., Dept. A., Newark, N.J.

**REFINE** used motor oil without cost. Particulars. Gerwin, Fairview, Oklahoma.

#### AUTO TRAILERS

**AMERICA'S** Handiest Trailer. Backs as easy as it goes forward. If you want a light, fast, handy, neat looking trailer write Economy Trailer Company, Sedan, Kan.

#### AVIATION

**AVIATION** needs men. Pilots, mechanics, draftsmen, sheet metal, positions open. Learn now. Free catalog. California Flyers School of Aviation, Dept. PSC-1, Los Angeles Airport, Inglewood, Calif.

**GET** into Aviation. Airline pilots get up to \$700.00 a month. Mechanics, \$200.00; Aeronautical Engineers, \$400.00. Prepare now at this Government Approved School. Write for complete information. Lincoln Airplane & Flying School, 2101 Aircraft Bldg., Lincoln, Nebr.

**AUTHENTIC** Diagrams, questions and answers for airplane mechanic's license \$1.25. Engine Mechanic's \$1.25. Both \$2.00 postpaid. Meyer Engineering, D-Box-8, Hempstead, N.Y.

**GRADUATE** Airplane Mechanic. Ten weeks. \$1.00 week! Graduates with leading concerns. Free catalog. United Air School, Elgin, Ill.

**LEARN** Aviation. Command big wages. Commercial Flying, mechanics taught. Free Booklet. Aeronautics, Dept. Z, Nauvoo, Ill.

**MODEL** Airplane kits and supplies for rubber and gas models. Large illustrated catalog 10 cents. Johnson's, Box 92, Route No. 1, Dayton, Ohio.

**AEROSLED** Motors, 80 horsepower, air-cooled, new, weight 285, overhead valves. Price \$75.00. Propellers \$10.00. Allison Aircraft, Lawrence, Kan.

**MODEL** airplanes, boats, radios, supplies. Catalog 3c. Imperial, 416-J McDonald, Brooklyn, N. Y.

**PROPELLERS** for Sleds, Aircraft. Catalog 5c. Banks Propellers, Love Field, Dallas, Texas.

**100 AIRPLANES** \$40.00 up. Terms. Complete Catalogue 25c. Used Aircraft Directory, Athens, Ohio.

**HIGH** Speed Sport Plane: Build it at home. Details 10c. Nimmo Aircraft Company, Box 27, Dept. S, Santa Monica, Calif.

**AVIATION** Apprentices: Air-minded Young Men interested in training for entering Aviation as Apprentices see ad on page 8.

**PROPELLERS** for airplanes, sleds. Also iced sled blueprints. Catalog dime. Lorenzen Propeller Company, Niles, Mich.

**LEARN** to fly Free. Folder, dime. Corrigan, D-Box-391, Hempstead, N.Y.

#### BATTERIES, GENERATORS, ETC.

**EDISON** storage batteries for lighting and power. Non-acid. Odorless. Fifteen year life. Five year unconditional guarantees. Reasonably priced. Tremendous savings in battery and light plant combinations. Free illustrated literature. See-Jay Co., 87 Sterling Ave., Yonkers, N. Y.

**ELECTRICAL** Arc Experimental Kit! Make powerful searchlight; melt glass, copper, iron; generate suntan rays, dozen others. Complete with power reducer, goggles, carbons, instructions, 110-volt. Postpaid \$1.99. Electrical Salvage Co., Box 524-SIO, Lincoln, Nebr.

**EDISON** lifetime storage batteries for light and power. Eliminate acid battery diseases. Long guarantee. All kinds rebuilt generating plants, motors, and miscellaneous articles at bargain prices. Free interesting literature. W. Hawley Smith Company, Croton Falls, N. Y.

**PLATING** generators and motor generator sets. Write for information. Hobart's new line electro plating equipment. Payments low as \$12.40 monthly. Quality machines, quick delivery guaranteed. Hobart Bros., Box P-191, Troy, Ohio.

**NEW** 110 volt A.C. Fanbelt generators for portable power. 8 sizes. Write LeJay Manufacturing, 123 LeJay Building, Minneapolis, Minn.

**RECAST** Old batteries into new. Latest achievements. Battery Laboratories, St. Paul, Minn.

#### BLUEPRINTS & PLANS

**MIDGET** Racers, Motorcycles, Bullet Sidecars, Sport Trailers, Rocket and Air-propelled Ice Boats, Speedboats, Super-charged Racing Hydro's, Sportcars. Pictorial Blueprints of 100 different streamlined Sportcraft designs for Amateur Mechanics, speed fans, modelmakers. Complete collection \$1.00 prepaid. Carl Meyer, 5504 Lisette, St. Louis, Mo.

**FIFTY** cents brings you a book containing complete instructions, diagrams and specifications for building fireplaces at less than half cost. Fireside Company, Albany, Ore.

**EIFFEL** tower 20c. Lawn figures. Imported blades 28c. Vincent Rundgren, 2147 Bell-plaine, Chicago.

**BOAT** blueprints. Many designs. Catalogue 10c. Cleveland Boat Blueprint Company, Station A-7, Cleveland, Ohio.

#### BOATS, OUTBOARD MOTORS, ETC.

**BUILD** Your Favorite Boat. Save on the Cost. The Welch System of Boat Building makes this possible. Send 10c for 32 page catalog showing Welch Designs, White Cap Motors, Boat Equipment. The Welch System completely explained in this interesting book. Use Welch Ready Cut parts and Build your Boat at home. Welch Boat Company, Station K-9, Milwaukee, Wis.

**SHIP** model construction sets, blueprints. Largest and finest selection of separate fittings. Leading manufacturer of model racing yacht fittings and sails. Send 20c (coin) for illustrated catalog. A. J. Fisher, 1002-S Etowah Ave., Royal Oak, Mich.

**BOATS**, build them yourself, our full-sized paper patterns make it easy. Send 10c for catalog. Melrose Boat Works, Magnolia Springs, Ala.

**FORD** Marine Conversion parts & kits. All Models. Catalogue 25c (coin). Osmithson, 3105 Rosehill Street, Philadelphia.

**KAYAKS**, kits, blueprints. Illustrated catalogue 10c. Viking Kanoe Co., Merrick, N. Y.

**OUTBOARD** motors. Used parts. All makes. Outboard Headquarters, 305 Atlantic Ave., Boston, Mass.

#### BODY-BUILDING COURSES

**EXERCISE** equipment, courses. Special offers! Free booklet. Good Barbell Co., Dept. 6, 947 Elm, Reading, Pa.

#### BOOKS, PERIODICALS, ETC.

**THE** secrets of the ages revealed to man, any one of the following books sent prepaid to you for \$1.00. Sixth and Seventh Books of Moses, Gypsy Witch Dream Book, Silent Friend, Marriage Guide and Medical Director, Albertus Magnus, Egyptian Secrets, White & Black Art For Man & Beast, The Science of Hypnotism, All Known Methods Explained, What Your Dream Meant, Book of Nature & Marriage Guide, Explaining The Organs of Life & Generation in Man & Beast. National Book Co., Bridgewater, Va.

**WE** Pay up to \$5000 each for old books, also high cash prices for old magazines, letters, newspapers. A single story book, school book, old Bible, travel book, almanac, etc., that looks worthless may bring you \$50.00, \$100.00 or \$500.00 in cash. Thousands wanted. Send 10c now for latest price list. American Book Mart, 140 S. Dearborn, Dept. 131, Chicago.

**SPARE-TIME** subscription representatives for all magazines. Instructions, complete starting supplies; free! Piness, 583 Monroe, Brooklyn, N. Y.

**FREE** catalog scientific, mechanical and technical books. Readers Service, 800-16 North Clark, Chicago.

**THRILLING** Novelties; Photos; Books. 30-Assortment \$1.00. Catalog 10c. Realvalue Sales, 815-S Hill, (708), Los Angeles.

**EXCLUSIVE** photographs. Samples. Complete list, 25c. Albert McGoldrick, Mansfield, Mass.

**SNAPPY** Photos, Books, Novelties, Catalog 10c. E.G. Specialties, Dept. P, 23 Glenn Ave., Carnegie, Pa.

**SEND** for free certificate redeemable for valuable merchandise. Stoller Lobell Co., 1560 Broadway, New York.

**BOOKS**, fiction and nonfiction, bargain list free. Siegel, 2213 North 31, Milwaukee, Wis.

**BACK** Date Magazines; Thousands half price. Send stamp for list. Book & Magazine Mart, Hutchinson, Kan.

**"HITLER** and the So-Called Jew." Most startling revelation in pamphlet form. 25c. Griffith, 53 East 130th, New York City.

**MAGAZINE** subscriptions. Edna Taft Van Buren, 1974-51st Street, Brooklyn, N. Y.

#### BUILD IT YOURSELF

**MARVELOUS** Acidless, Metal Tool Etching materials, 22 year instantaneous calendar, catalog, all 25c. Scientific, Practical materials, instructions, supplied economically. Specialty Laboratories, 3835 Cambridge, Phila., Pa.

**BUILD** power Scooters, Midget Cars. We supply tires, wheels, motors. Lowest prices. Send 10c for plans, etc. Bild-Ur-Own Devices, 5240 Lake, Chicago.

**MOTORS**, tires and wheels for building power scooters, midget cars, etc. Low prices. Literature free. Power scooter plans 10c. Honsaker, Masontown, Pa.



## BUSINESS OPPORTUNITIES

**FORTUNES** are being built on waste. Used motor oil holds hidden wealth. Millions of gallons drained and thrown away yearly. Our Precision Refining Unit recovers a daily average of 40 gallons of high quality, rich bodied oil from a barrel of waste drainings. In use by U.S. Gov't. Tremendous profits up to \$18.00 a day supplying consumers at 12c a quart. Average refining cost only 2c a quart. No training required. Modest investment offers you a profitable business, complete equipment and exclusive territory. Don't delay, write for complete details. Precision Engineering Sales Company, Dept. 101, 4300 Mill Creek, Kansas City, Mo.

**HONEST Men** Wanted to own lifetime business. \$2.00, \$5.00 hourly profit. Prestige, cooperation National organization individually-owned businesses. Clean, rejuvenate, mothproof upholstery, carpets, clothing in homes, hotels, institutions. Certified service. "Earned \$90.00 one day," Andersen. "Working 12 hours daily," Lookiebill. "Work advertises itself," McCoy. "Repeat orders building business," Hargrave. Portable electric machines, materials, demonstrators, advertising furnished. Little as \$88.00 establishes business. Write while territories open. Home Service, 181-PI, Deerfield, Ill.

**PLASTEX Industries** offer industrious men an opportunity to start a business of their own, manufacturing art goods, novelties and utility products in Plastex and marble imitation.  $\frac{1}{2}$ c material makes regular 10c store sellers. Rubber moulds furnished for speed production. Small investment brings big returns. Nationwide demand in these low priced goods. Ambitious men have chance for real prosperity. Plastex Industries, Dept. S., 1085 Washington Ave., New York, N. Y.

**HERE'S A Real Opportunity.** If you want a business of your own that is substantial money maker right now and has unlimited future; And if you have \$500.00 cash to operate a business in an industry which Roger Babson predicts will, in ten years, be larger than automobile industry is today, write Department 21, Box 187, Lafayette, Indiana, for complete details.

**ARTIFICIAL** marble sanitary flooring, in-struction covering wood or cement flooring  $\frac{1}{2}$  inch thick, fireproof all colors, low cost, ornamental casting, concrete, plaster, papier-mache garden furniture, statuary, flexible molds, particulars free. O. Mahler, Elmont, N. Y.

**MAKE Money at Home!** Grow Mushrooms in cellar or shed, with Ami U. S. Patented Mushroom Spawn and step-by-step, easy-to-follow Manual of Instructions. Fascinating, profitable. Booklet free, write today. Anglo-American Mushroom Industries, Dept. 28, Toronto, Ont.

**WE** help start you in business, furnishing Outfits and Instruction, operating "Specialty Candy Factory" home. Men and women, opportunity to earn \$20.00 to \$50.00 weekly, all or spare time. (Our 29th year.) Booklet free. W. Hillyer Ragsdale, Inc., Drawer 14, East Orange, N. J.

**FREE.** Big 32-page book explaining composition novelty manufacture! Tells you how to make extra money in your spare time! Supply limited! Write today! Stewart's Studio, Dept. S-9, 2927 Wilcox, Chicago.

**COLOR** concrete surface with chemical solutions. Beautiful pottery without moulds. Garden wishing-wells. Stucco rock. Glazing concrete. Sample 10c. Hollywood Cement Craft, 8530 Wonderland, Hollywood, Calif.

**MAKE** Artificial marble, glazed tiles, uncanny. Tabletops, plaques, floors, hones, novelties. Hard, fireproof, inexpensive, cement secrets. Brilliant tile and liquid rubber samples 3c. John J. Payn, 945 Grande Vista Avenue, Los Angeles, Calif.

**FOR** your car, household use, or operate Electric Simonizing Station. Cash in on labor-saving invention. Only \$29.50. Should net you approximately \$300-\$400 month. Write Bissell's Manufacturing, 3320-PS Archer, Chicago. Dealers wanted.

**PROFIT** with new products. Make, sell, repeat. Analysis. Research. Guaranteed formulas. Biggest catalog free. Special prices, leads. Gibson Laboratory, Chemists, FO-1142 Sunnyside, Chicago.

**LEARN** arc welding—A growing industry with great opportunities. Consult your local school, or if there is none available write The Lincoln School of Welding, Dept. B, Box 5758, Cleveland, Ohio.

**\$35.00 PER Week.** Repairing Sewing Machines. Own boss, Steady Business. Wake up, Make Money, Be Independent. Our Book Instructions \$1.00 tells you how. Connan, 508 S. W. Second, Portland, Ore.

**THE** Office Specialty Sensation of the year; new model envelope sealer, sells \$2.50. Demonstration makes quick sale. Responsible distributors write Kendall Sealer Co., Dept. F., East Jaffrey, N. H.

**MAKE** 1939 your "Big-Money-Year" easily making today's greatest-selling products from latest certified formulas. Stamp brings valuable details. Miller, Chemist, 1708-Jb, Tampa, Fla.

**ATTENTION!** Start local business of your own. Easy to operate. No selling. Be independent. Small investment required. Details free. General Sales, Box 535, Minneapolis, Minn.

**DO You Want More Money?** "Think and Grow Rich." Teaches the Thirteen Steps to Riches. Quick and Easy to Learn. \$2.00 Prepaid anywhere USA. LaBahn, 603 Main, Evanston, Ill.

**SUCCEED** with your products. Make-Sell them. Formulas. Processes. Accurate Analyses. Catalog free. P. Thaxly Company, Washington, D. C.

**IMPORTING!** Wholesale supply directory of foreign manufacturers and exporters. Over five million items, 10c postpaid. Bison Service, D-PS, Buffalo, Minn.

**IF** you have some spare room where you can do light work, see our offer on page 43. Metal Cast Products Co., 1696 Boston Road, New York City.

**107 WAYS** to make money, in home or office, business of your own. Full particulars free. Elite Co., 214-A Grand St., New York.

**1000 MEN** Wanted, Year Round Business. Big Money Possible. \$10.00 Starts you. Free Particulars. Walt Journeay, Orange, Tex.

**FOR** an extremely profitable lifetime business, operate a Collection-Credit Agency. Free folder. Cole Associates, Syracuse, N. Y.

**CASH** in on big demand for Mexican Novelties! Large profits! Particulars free. Samples 10c stamps. Marquez-IBC, Apartado 1176, Mexico City.

**GROW** Vegetables and flowers without soil. New chemical formula makes it simple. Send 50c for complete instructions and formula. Mt. Hi. Engineering Co., Casper, Wyo.

**"BINGO,"** new coin operated amusement game. Large income, operating "route." Small investment. Details free. Robbins, 1143 Dekalb Ave., Brooklyn, N. Y.

**\$\$\$ INVESTIGATE** work Stamping Social Security Keychecks. Sample. Details 25c (coin). Practical Novelty Service, 1305 Walnut Blvd., Ashtabula, Ohio.

**LIQUID** Marble, Brush, spray, mold it! Composition Flooring, Rubberlastic Molds. Particulars Free. Marbleizing Service, Edwardsville, Ill.

**6 MAIL** order magazines including all you should know about mail order business, 25c. Armand Cartier, 31 Cumberland St., Woonsocket, R. I.

**WANT** a raise? Laid off? Read "Human Efficiency." Efficient workers hold jobs. Write for circular or send \$1.00. Shertzer, 970 Weber, Pomona, Calif.

**REGULAR** \$275.00 Strip Photo Outfit. Makes 4 for dime, also 3 for quarter size photos, \$125.00 complete. Hassan, Box 971, Parkersburg, W. Va.

**SELL** by mail! Books, novelties! Bargains! Big profits. Particulars free. G. Elco, 438, North Wells, Chicago.

**WHERE** to buy at lowest wholesale prices. Information free. Yorens, Box M-312, Bayonne, N. J.

**LIKE** to draw? Earn steady income tracing and duplicating cartoons for advertisers. Adservice, Argyle, Wis.

**HOW** and where to obtain capital fully explained, free particulars. Star Service, Wapakoneta, Ohio.

**CALIFORNIA** Jobs, information, opportunities. Address postcard to Crampton, Soda Springs, Calif.

**PROFITABLE** Opportunities for Ambitious People. Write today. Hemingway's Sales Service, 25 Oak Knoll Road, Natick, Mass.

**"1939 BUSINESS Folio."** Send for free copy. Hutchison, 314 North Fourth, Camden, N. J.

**BUY**, 2c lb., sell, 50c to \$4.00 lb. Details 25c postpaid. Money-back guarantee. McArthur, Drawer 339-8, Butte, Mont.

**PRODUCE** "Soilution" at home. A new industry. C. E. Farms, Highland Park, Los Angeles.

**BALLGAMES,** Movies afternoons. Work mornings home, your own business. Write Stamforde, 3762-L Broadway, New York.

**COUNTRY** Drives or movies afternoons! Work mornings home. No canvassing! Folios, Station D, Los Angeles.

**GOODBODY'S** bargain list is waiting for You. We Buy, Sell or Exchange. S. Goodbody, 1824 East Main St., Rochester, N. Y.

**FASCINATING** business or hobby, learn electric arc welding at home. Free particulars. Roy Ankerman, Wapakoneta, Ohio.

**MAKE** your own rubber molds. Sample and details free. June, 101-A Beech, Holyoke, Mass.

**CARPENTERS:** Sell, install overhead garage door hardware. Pays well. Circular free. Wilkie, Independence, Mo.

**ADDED** income ideas. Mail Sales News Magazine, copy 10c. Katz, 4254 No. Kimball, Chicago.

**\$1.90 PROFIT** on each \$2.00 mail order. Guaranteed legitimate. Particulars free. Poppe-Director, Drawer 989, Edinburg, Tex.

**HANDY Men:** Earn money home operating Community "Fix-It" Shop. Stafford, Makanda, Ill.

**WRITE** for Free Booklet, "Businesses of Your Own That Pay Best." Nu-Idea Sales, Carrollton, Ill.

**SUCCESS** in your chosen field. 26 new Enjoyable Prosperous Plans, \$1.00. Eugene Morrison, Culver City, Calif.

**CASH** newspaper clippings. Some worth dollars. Galvin, Apt. 724, 207 E. 84, New York.

**MANUFACTURE** Insulation. 10c brings sample, information. Continental Insulation, 412 Watson St., Aurora, Ill.

**START** Moneymaking! 101 Plans 35c. Bohn, P. Box 86, Wilkes-Barre, Pa.

**CAMERAS, PHOTO SUPPLIES**

**BASS:** at the Camera Cross Roads of the world has just issued a new and sensational Bargaingram No. 235 listing outstanding values in cameras and accessories. Here are a few typical items: Bass's own DeFranne Sport, 18 or 8 shots on 120 roll film with F:3.8 lens, Prontor II shutter, velvet lined case, \$29.75; Dollina II, Range-finder coupled Radioran F:2.9 lens, Compur Rapid shutter, \$49.75; Super Press Bee Bee 6 $\frac{1}{2}$ x9 cm. film pack and plate with F:2.9 lens, \$59.75; and dozens of other superb values. Order from above or get Bass's free Bargaingram. Write Dept. SP, Bass Camera Co., 179 W. Madison St., Chicago, Ill.

**CAMERAS** and supplies. Free illustrated catalog listing everything photographic—still and movie cameras, films, lenses, at tremendous savings. Hundreds of bargains, new and used. All guaranteed. We take your old camera or equipment in trade. Write now for your free copy of our newest money-saving bargain book; just out! Limited edition. Hurry! Central Camera Co., (Photographic Headquarters since 1899), 230 South Wabash, Dept. 1-S, Chicago.

**IF** you go to Mexico, ask first for prices and pamphlets of finest German quality miniature and other cameras, binoculars, movie cameras and projectors. Foto Mantel Sucr. R. Rudiger, V. Carranza 11, P. O. Box 1459, Mexico City-111. Branch store: Tijuana, Lower California, Hotel Commercial. Branch Store: Monterrey, N. L., Morelos Oriente No. 557.

**NO** more wasted film or unnecessary expense. Take pictures you can be proud of. Sell to magazines and newspapers. Make good money wherever you live. Easy, low-cost home study course shows you how! Free catalog. Universal Photographers, Dept. T, 10 W. 33 St., New York City.

**MAKE** money in photography. Learn quickly at home. Spare or full time. Easy plan. Previous experience unnecessary. Common school education sufficient. Interesting booklet and requirements free. American School of Photography, 3601 Michigan Ave., Dept. 1742, Chicago.

**SPEED-O-COPY:** The groundglass focusing attachment for Leica and Contax. Send for literature. D. Paul Shull, Dept. PS, 240 S. Union, Los Angeles.

**20% TO 40% discount** on films, paper, still or movie cameras. Write: Paramount Co., 327-PS, East 92nd St., New York.



**FOTOFOLIO.** The new method of mounting snapshots. Compact, 25 pictures to the page, at leading dealers. Write for free booklet. E. E. Miles Company, Dept. F., So. Lancaster, Mass.

**DRY** mount photos in albums with handy Fotowelder and Fotoflat Prints. Lie beautifully flat. Price Fotowelder, \$3.75. Price Fotoflat, 15c, 3 dozen sheets. Seal Inc., Shelton, Conn.

**MAKE** money selling snapshots. Dime brings 100-page book, complete instructions, buyers, real information. Lyons-Publishers, 402-R Evans Bldg., Washington, D. C.

**ENLARGER** \$1.59. Makes postcard size from small negatives. Fully guaranteed. Paramount Sales Company, 89 Dudley Street, Boston, Mass.

**ARGUS** ever-ready camera case, genuine leather, with shoulder strap. Special with this ad, \$1.69. Microtex, 6241 Southwood, St. Louis, Mo.

**CENTURY** 5x7 studio camera, Darlot lens. Studio stand. Nice condition, \$58.50. Camera list for stamp. H. R. Johnson, Box 206, Baltimore, Ohio.

**AMBERTINT** 16mm. camera film \$1.85 for 100 feet, including machine processing. Daylight loading. Weston & Hollywood Studios, South Gate, Calif.

**LOOK!** Midget Camera with Film. Takes clear pictures. 25c coin. Havco, Englishtown, N. J.

**8mm, 16mm FILMS,** equipment bargains. Sale, rental. Send stamp for lists. Abbe Films, 1265 Broadway, N. Y. C.

**BOTTOM** prices quoted; anything photographic. No catalog. Spicer Photo, Beloit, Wis.

#### CAPITAL

**CARNIVAL** Games make you money. Outfits supplied. Illustrated literature 10c. "Moore-Made," LaPeer, Mich.

#### CARTOONING, SIGN PAINTING, SHOWCARD WRITING

**MORQUE:** Artists' Ready Reference. Compact collection helpful drawing aids, money-making tips. Extremely valuable to students, beginners, professionals. First series over 200 drawings, hands, arms. Send 50c coin. Metro Studios, Box 473-S, South Bend, Ind.

**PAINT** signs for profit. Fine lettering fast with Speedway Patterns. Modern styles, many sizes. Free samples, literature. For 3-in. alphabet send nickel. Display Letters Co., 8309 Third Ave., Brooklyn, N. Y., Dept. 8.

**CARTOONING,** modern streamlined method. 50c each lesson ordered, or \$2.00 complete 5-lesson course. Individual attention. VonRuden, Poplar Bluff, Mo.

**PROFESSIONAL** Cartoonists will correct 5 of your drawings; supply pens, paper, pencils; list of markets. \$1.00. Bay Studios, 2062 E. 29 St., Brooklyn, N. Y.

**LIKE** to draw? Earn steady income tracing and duplicating cartoons for advertisers. Adservice, Argyle, Wisc.

**LEARN** Cartooning from my original drawings. First lesson free. Templeton, Lavallette, W. Va.

#### CHALK TALK STUNTS

**LAUGH** producing program. \$1.00. Illustrated catalog 10c. Cartoonist Balda, Oshkosh, Wisc.

#### CHARTERS

**INCORPORATE** In Delaware. Liberal laws, low costs. Corporation Registration & Trust Company, Dept. C, 927 Market Street, Wilmington, Del.

**DELAWARE** charters; complete service \$35.00. Submitted forms. Chas. G. Guyer, Inc., Wilmington, Del.

#### CHEMICALS & APPARATUS

**CHEMICALS:** High quality reagent chemicals, same as used by industrial and educational laboratories, sold in packages most economical for the small user. Send 10c for catalogue and learn about our special Christmas gift. New York Scientific Supply Co., 111 East 22nd St., New York, N.Y.

**HANDBOOK** for chemical experimenters, hundreds of experiments, illustrated, 50c. Experiment booklet 15c. Chemical catalogue 10c. Reading Scientific Co., Reading, Pa.

**FREE** chemistry catalog. Supplies at 5c. Equip complete laboratory. Send 3c for postage. Kemkit Scientific Corporation, 397B Bridge Street, Brooklyn, N. Y.

**FREE:** 40 page catalog of chemical and laboratory supplies for amateur chemists. Wollensak microscopes and supplies, scientific books at big discount. J. C. Winn, 124 West 23 Street, N. Y. C.

**KNOW** how acid, how alkaline your solutions are. New Hydron outfit shows 14 color changes on acid-alkaline scale. \$9.50. Leaflet P12 on request. R. P. C. Company, 116 Liberty Street, N. Y. C.

**ANALYSIS.** Research. Newest guaranteed formulas. Biggest catalog free. Special prices, leads. Gibson Laboratory, Chemists, FD-1142 Sunnyside, Chicago.

**FREE** cosmetic chemistry course to our December customers. Send 3c stamp for chemical catalog. Clinton Chemical Company, Swedesboro, N.J.

**MICROSCOPES,** mineralogy, chemistry, telescopes, binoculars. Catalog free. Tracey Laboratories, Evanston, Ill.

**LABORATORY** Spectroscope for chemical analysis \$2.50. McCutting Sons, Campbell, Calif.

**CHEMICALS,** rare and common. Catalogue, 3c. Chemical Service, 2827 N. Rockwell, Chicago.

**CHEMICALS** in 5c quantities. Catalog 5c. Fleischer's Laboratories, Everett, Mass.

**RARE** chemicals. List, sample for dime. Ernest Snow, Lexington, Mass.

**JOIN** American Amateur Chemists Society. Journal, Particulars 10c. Haslett, Mich.

#### DETECTIVES

**DETECTIVES** earn big money. Make secret investigations. Experience unnecessary. Detective particulars free. Write. George Wagoner, 2640-P Broadway, N. Y.

**DETECTIVES.** Secret Investigations. Short Easy Method. Home. Travel. Particulars Free. Write International Detective Training, 577-P Orpheum Bldg., Jersey City, N. J.

#### DOGS, BIRDS, PETS

**LIVE** Florida Baby Alligators. Harmless. Attraction for Window Display. Ideal Xmas Gift. Children go wild about them. Postpaid \$1.50. Alligator Farm, Orlando, Fla.

**WHITE** Collie Pups, the most beautiful specimens the dog world can offer. Stamp for Catalogue. Comrade Farm Kennels, Gallon, Ohio, Box T.

**ANIMALS.** Snakes, Iguanas, Gila Monsters, Monkeys, Parrots, Parakeets and Macaws for Pets and Show. Lists free. Snake King, Brownsville, Tex.

**OLD** English sheepdogs. Unusual! Unique! Devoted! AKC Typical Custer Kennels, New Rumley, Ohio.

**REGISTERED** Great Danes. Reasonable, dependable. Near-human intelligence. Kalmar Kennels, Stone Mountain, Ga.

**FOR** sale, (Borzoi) Russian Wolf Hound puppies, Champion stock. A. R. Adams, Lincoln Park, N. J.

**ENGLISH** Bloodhound Pups. Registered from famous hunting and trailing strains. Sutton, Decatur, Mich.

**BEAGLES,** Rabbit, Fox, Coon, Opossum, Skunk, Squirrel, Dogs, Setters, Pointers. Brown's Kennels, White-Hall, Md.

**SAINT** Bernard woolly puppies, reasonable. Illustrations free. Royal Kennels, No. 80, Chazy, N.Y.

**COCKER** Spaniels, Champion Bred, Outstanding Quality. Reasonable. Mary Hankinson, Sinclairville, N.Y.

**COCKER** Spaniels: Beautiful blacks, reds; pedigreed; eligible registration. Julalene Kennels, 1332 Hull, Louisville, Ky.

**ST.** Bernard puppies: Prices, Colored Premium free. Manitou Kennels, Watrous, Sask., Canada.

#### EDUCATIONAL & INSTRUCTION

**TERRESTRIAL** Globes. World in turmoil! War rampant! Intelligent understanding of events makes geographic globe indispensable in home, school, and office. Superbly-colored 7" globe, \$1.00; 10" globe, \$1.50. Free booklet included. "Know Your World." Unusual buy. Ideal Christmas gift. American Scientific Specialties Co., Box 6, Ft. Hamilton Station, Brooklyn, N. Y.

**"UNCLE SAM"** 1939 Jobs. Start \$105.00, \$175.00 month. Men, women. Prepare now for next examinations. Common education usually sufficient. Full particulars, list positions, Free. Write today. Franklin Institute, Dept. F48, Rochester, N. Y.

**LEARN** tool, die, machinist work, screw-machines. Booklet "G" free. Allied School, 615-W Lake, Chicago.

**500,000 USED** correspondence courses and educational books. Sold. Rented. Exchanged. All subjects. Satisfaction guaranteed. Cash paid for used courses. Complete details and bargain catalog free. Send name. Nelson Co., 3338 Manhattan Building, Chicago.

**BACTERIOLOGICAL** Sets: Ideal for teacher, student, amateur. Includes cultures, media, slides, stains, experiment book and all necessary equipment. Send for information. Christensen Laboratories, Brigham, Utah.

**USED** correspondence courses and Educational Books sold or rented. Inexpensive. Money-back guarantee. Write for Free Catalog listing 4000 Bargains. (Courses bought). Lee Mountain, Pisgah, Ala.

**PREPARE** for coming Civil Service exams. Start \$1260-\$2100. Two complete tests, \$1.10. Valuable information, list jobs free. Write today sure. Pergande Publications, Milwaukee, Wis.

**FOREST** jobs available \$125-\$175 month. Cabin, Hunt, trap, patrol. Qualify immediately. Write Rayson Service, C-61, Denver, Colo.

**IF** you like to draw, sketch or paint—Write for talent test (no fee). Give age and occupation. Write Federal Schools, Inc., Dept. PS128, Minneapolis, Minn.

**LEARN** Watchmaking, Complete Instructions \$1.75. Wholesale Catalog Tools, Supplies 5c. Stewart's, 721 Olive, St. Louis, Mo.

**JOB-Seekers.** Clerical-Professional. For results try our job getting instructions. Employment Counsellors, Box 1283E, Milwaukee, Wis.

**PENMANSHIP.** Learn to earn. 70-lesson course, superb pen-written copies, \$2.00. Portfolio, Beautiful specimens 10c. L. H. Hausam, 558S, Emporia, Kan.

**MASSAGE,** Hydrotherapy, dietetics, drugless therapeutics, chiropody, taught by mail. Evans Correspondence School, Montgomery, Ala.

**SHORTHAND** Simplified, complete, \$1.00. Lesson 10c. Lindsley, 7 Arlington Place, Newburgh, N.Y.

**CIVIL** Service home study courses. 50c to \$1.00. Write for list. Merit Publication, Munsey Bldg., Washington, D.C.

**LEARN** Auto mechanics, body, repairing, welding, electricity, refrigeration, Diesel. Stevinson's 2008E Main, Kansas City, Mo.

#### ELECTRICAL SUPPLIES & EQUIP.

**MAKE** Money electroplating! Marvelous patented invention plates with electric brush, easy as painting. Does same beautiful, permanent electroplating; gold, silver, nickel, cadmium, etc., as big tank outfits. No liquids, lightweight, portable. Anyone can use from battery or household current. Only \$6.85 complete. Write for details and sample of work done. Warner Electric Co., 360 N. Michigan, Dept. B-20, Chicago.

**1 HORSE** 1750 speed, repulsion induction, alternating motor \$22.50.  $\frac{1}{4}$  horse—\$19.00. Others. Electrical Surplus Co., 1885 Milwaukee, Chicago.

**ELECTRO-SCRIBE:** Electric Pencil writes—engraves all metals. \$1.00 postpaid. Details. Beyer Mfg. Co., 4515-Z Cottage Grove, Chicago.

**APPROVED** hearing aids, batteries. Big savings. Trial basis. 363 N. E. 76 St., Miami, Fla., Literature 3c.

**EXCHANGE** or Swap. Electric Motors, Fans, Appliances, Machinery. What Have You. Arcade Electric, Freeport, N.Y.

**MAGNET** New Alloy lifts 50 times its own weight \$1.00. Advance-861-PSI, Minneapolis, Minn.

**ELECTRIC** Fencers: Assemble kits \$3.50, up. Insulators, accessories, list free. Farm Service Corporation, Rochester, Ind.

**ELECTRIC** pen, engraves all metals, dollar. Hudson Bros., East Syracuse, N. Y.

#### ENGINES, MOTORS, ETC.

**BARGAINS:** Electric shaver \$1.48;  $\frac{1}{4}$ " drill \$3.69; candid type camera \$1.89; Motors, grinders, radios, clocks, appliances. Illustrated Pricelist free. Mailorder Electric Co., 705 So. Dearborn, Chicago.

**BARGAIN**  $\frac{1}{2}$ H.P. motors, 60 cycle, 1 phase, 110 volt, 3600 r.p.m. like new, guaranteed. \$8.25. Send check to Erie Electric Motor Co., 120 Church St., Buffalo, N.Y.

**MOTOR** rewinding lessons, illustrated. Send stamp for particulars. Motor Data, Box 7631, Kansas City, Mo.



REFINE used motor oil without cost. Particulars. Gerwin, Fairview, Oklahoma.

#### FARM LANDS

GOOD Farms available. Washington, Minnesota, Idaho, western Montana, Oregon. Dependable crops, favorable climate. Write for impartial advice, literature and lists of typical bargains. Specify state. J. W. Haw, 120 Northern Pacific Ry., St. Paul, Minn.

FORTY room, furnished, Ocean Front Hotel, at Nags Head, N.C. S. Worthington, Wilson, N.C.

ADIRONDACKS. Sportsmen Paradise. Free folders. Charles Tyre, Corinth, N. Y.

#### FENCING

FENCING equipment. Foils, swords, masks, etc. Low prices. Free catalog. Industrial Products, Dept. E111, 48 West 48th Street, N. Y.

#### FIELDGLASSES, TELESCOPES & MICROSCOPES

BUILD reflecting telescopes, 6" kit, \$3.50; other kits; all abrasives, mirrors, eyepieces, diagonals, illustrated instructions, 10c. Catalog free. Optical Development Corp., Dept. F, 1560 Broadway, New York.

USED microscopes, binoculars, astronomical telescopes—Bought, sold, repaired. Send 10c for list. Rasmussen, P. O. Box 294, Amsterdam, N. Y.

MICROSCOPES, Slide making supplies, reagents and stains. Send for free circular M38, Biological Supply Company, 1176 Mt. Hope Avenue, Rochester, N. Y.

TELESCOPES, Microscopes, Binoculars; 1939 bargain catalog free. Brownscope Company, 5 West 27th Street, N. Y.

MICROSCOPES, mineralogy, chemistry, telescopes, binoculars. Catalog free. Tracey Laboratories, Evanston, Ill.

#### FOR THE HOME

KEEP cellar free of Fly Ash when filling ash can. Photo, Instructions 25c. P. O. Box 451, Cincinnati, Ohio.

#### FOR INVENTORS

PATENTS. Before too heavy an outlay of time or money is made on an invention, a search of the Patent Office records should be made to determine as nearly as possible whether or not the same idea has been patented before. The cost of this search is small, while the value of the facts it uncovers is often considerable. We offer inventors and manufacturers a thorough, prompt, confidential search service—plus experienced counsel and assistance in every phase of Patent and Trade-Mark practice. Write for our new free book containing valuable information relating to patent procedure. Clarence A. O'Brien and Hyman Berman, Registered Patent Attorneys, 697-P Adams Building, Washington, D. C.

PATENT your idea. Write immediately for two free books, "Patent Protection" and "When and How to Sell an Invention." Fully explain many interesting points to inventors and illustrate important mechanical principles. With books we also send "Evidence of Invention" form. Prompt service, reasonable fees, thirty-nine years' experience. Avoid risk of delay. Address: Victor J. Evans & Co., Registered Patent Attorneys, 59-M Victor Building, Washington, D. C.

INVENTORS: Before disclosing your invention to anyone send for Form "Evidence of Conception"; "Schedule of Government and Attorneys' Fees" and instructions. Sent free. Lancaster, Allwine & Rommel, 413 Bowen Building, Washington, D. C.

INVENTOR'S Universal Educator; contains 900 mechanical movements; 50 perpetual motions; instruction on procuring and selling patents and selecting an attorney, etc. Suggests new ideas. Price \$1 postpaid in U.S.A. Address Albert E. Dietrich, 681-A Colorado Bldg., Washington, D. C.

IDEAS and Practical Inventions developed and promoted. Protection guaranteed. Blue print and engineering service. Write for 4-Point Service bulletin. R. & S. Engineering Company, 17 East 42nd Street, New York, N. Y., Dept. 8F-12.

INVENTORS: Sell your unpatented invention with positive safeguards under patent laws. New low-cost procedure. Complete details free. American Patents Corp., Dept. 30-E, Washington, D. C.

HAVE you a sound practical invention for sale, patented or unpatented? If so, write Chartered Institute of American Inventors, Dept. 3-A, Washington, D. C.

WE locate buyers meritorious patented, unpatented inventions. If would accept reasonable cash or royalty, write Inventions Reporter, 3A-11236 So. Fairfield, Chicago. Booklet free.

INVENT Perpetual Motion, get 15% royalties, start with copyrighted basic plans, working model and agreement. \$1.00. Co-Inventors' Guide, 504 Adeline St., Trenton, N.J.

INVENTORS: State lowest price for your invention, and send details at once to Adam Fisher Company, 183 Enright, St. Louis, Mo.

MANUFACTURING Tools, Dies, Stampings, Models. Federich Tool Co., Box 10, East McKeesport, Penna.

IF you have a practical invention for sale, write National Service Bureau, Dept. K-1, St. Louis, Mo.

CASH for unpatented ideas. Stamp appreciated. Mr. Ball, 9441-B Pleasant, Chicago.

"INVENTIONS Protected and Sold," \$1.00. Details free! Daniels, Garrett, Ind.

INVENTIONS bought, sold. Patented, unpatented, James Wallace, Homer, N. Y.

#### FORMULAS, PLANS, ETC.

FORMULAS: 15 proven moneymaking formulas \$1.00. (Not stock-formula catalogue stuff), real unusual offers. List free. Marvel Laboratories, 6629 No. Maplewood, Chicago.

ANALYSIS. Research. Newest guaranteed formulas. Biggest catalog free. Special prices, leads. Gibson Laboratory, Chemists, FA-1142 Sunnyside, Chicago.

THAXLY formulas for perfect products. Accurate analysis assured. Resultful research. Catalog free. P. Thaxly Co., Washington, D. C.

SUCCESS is sure with Miller's Certified Formulas with simplified manufacturing service. "Not cheapest but best." Miller, Chemist, 1706-Jf, Tampa, Fla.

GUARANTEED formulas. Lowest prices. Catalogue free. Kemico, 500-N Park Ridge, Ill.

FORMULAS?? Literature Free!! (Chemical Gardening Formulas, \$1.00; C. O. D., \$1.20)!! Galluzzo, Wilkingsburg, Pa.

FORMULAS—Latest Money Makers. Literature Free. E-Belfort, 4042 N. Keeler, Chicago.

MOTOR Oil 2c gallon. Reclaim used oil. Formula 25c coin. George, 285 Queen, Germantown, Philadelphia, Pa.

FORMULAS: Three Famous Money Makers \$1.00 Cash. Mobley, Box 3176, Hollywood, Calif.

"ANYTHING in formulas?" Particulars free. "Research Bureau," 100c Chelsea, Charlestown, Mass.

ZINC cuts anyone can make. Instructions \$1.00. Jeff Ricketts, Salinas, Calif.

FORMULAS: All kinds, Catalog Free. Clover Formulary, 108-A, Niles Center, Ill.

TEN Guaranteed formulas, \$1.00. Williams, 2236 Centre Ave., Pittsburgh, Pa.

#### GAMES, ENTERTAINMENT

CATALIN Chessmen, bargain at \$10.50 postpaid, including handsome case. Write for circular. Braidwood, Perth Amboy, N. J.

PASTIME for the whole family. 1000 problems. Interesting and educational. 25 cents. No stamps. Watchman's Puzzle, 105 Brookview Ave., Troy, N. Y.

CHESS. Instructive, Interesting. Particulars free. Chess Thoughts, Pearl River, N.Y.

16 DUPLICATE Bridge Boards, \$1.00, postpaid. Duplicate Board Co., Syracuse.

#### HELP WANTED

M.M. EARNED \$267.00, three weeks, raising mushrooms in cellar! Exceptional, but your cellar, shed, perhaps suitable. We buy crops. Book free. United, 3848 Lincoln Ave., Dept. 242, Chicago.

NEW Ideas. Bargains, Opportunities, Profits! Sample 20c. Want Ad World, Mansfield, Ohio.

CIVIL Service Exams coming. 1000 different jobs. Free list. Notification Service, 424B W. 59 St., Chicago.

#### HIGHGRADE SALESMEN

SELL Xmas cards, calendars, Business cards \$1.50 thousand. Business station-

ery, book matches, advertising tape, paper towels, pencils, salesbooks, rubber stamps, tags, menu covers. Free Sales portfolio. 35% commission daily. Money making specials. Willens, 2130 Gladys, Dept. CE, Chicago.

MAKE Big Daily Cash Profits. Sell Top Quality Advertising Book Matches, part time. Experience unnecessary. Full time profits unlimited. Free Sales Kit. Free Zipper Case Offer. Match Corporation of America, Dept. N-1, 3435 48th Place, Chicago.

MAKE more money with Red Comet Automatic Fire Extinguishers. Low Price. Proved seven years. Splendid sales outfit free. Some good territory open. Exclusive. Write quick. 744 Red Comet Building, Littleton, Colo.

NEW Cigarette Support, eliminates unpleasant Cigarette odor in Automobiles, Homes, etc. Sample 25c Coin. Smok-O-Luxe Mfrs. Box SC62, Collinsville, Ill.

SELL New Hexagon portraits. Big profits. Lowest prices portraits, frames. Catalogue free. Picture-Man Friedman, Dept. 12, 528 Cornelia, Chicago.

#### HOBBIES, COLLECTIONS

FINEST Hobby. Collect Land Shells. My new booklet and three tropical specimens 25c. Real Dollar value. Webb, 202 Westminster Road, Rochester, N. Y.

#### HOME CRAFTSMEN

HOME CRAFTSMEN. Craft Instructors. Students. Stock up while these bargains are available. Ideal shop lots of Plywood Panels, faced with fine cabinet woods, walnut predominating. Some inlaid. Miscellaneous sizes, averaging about 2 Sq. Ft. per Piece, 25 Sq. Ft. \$2.50, 50 Ft. \$4.50, 100 Ft. \$7.75, 500 Ft. \$35.00. Bargain lot 1/28 Veneers, guaranteed to contain at least 10 species of fine cabinet woods, 100 Square feet \$3.25, 250 Square feet \$7.50. Cash with order. F. O. B. New Albany, While they last. Artwoods, P. O. Box 255, New Albany, Ind.

PLYWOOD at Wholesale. Everything in plywood and veneers for the professional and amateur craftsman. Complete stock of foreign and domestic woods at wholesale prices. Send 10c for new interesting catalog. Your dime refunded on first order. Beck Plywood & Veneer Co., 1308 N. Halsted St., Chicago, Ill.

SQUAREKNOTTERS! Make belts, handbags, etc. Quality cord samples with catalog, free. Beginners book, catalog and samples, 10c. Special! Regular \$1 book with 50c beginners outfit, all for \$1. P. C. Herwig Co., Dept. P-13, 121 Sands St., Brooklyn, N. Y.

WANTED. We have many customers waiting for used machinery and equipment needed by home craftsman. Immediate cash. Must be good condition and reasonable. Send details now. Craftsman's House, 315M Harding St., Avoca, Pa.

MEXICAN designs for making pictures from wood. 20 patterns, complete instructions 25c (coin). 20 cowboy novelty patterns 25c. 10 lawn ornament patterns, 15c. Mexican Arts, Crafts, Box 332, Eagle Pass, Tex

NEW manual on Catalin, superior colored plastic. Your opportunity for Christmas gifts or saleable articles. Send dime to Fanwood Specialties, Box D, Scotch Plains, N. J.

JIG and band saw blades, venetian blind supplies. Literature upon request. Send 3 cent stamp for two plain end sample blades. Homecraft Supply, Box 101, Aurora, Ill.

DESIGN your own furniture. Our complete course shows you how. Only \$8.50. Invaluable to home craftsmen. Write for descriptive folder. Klok Institute, 430 Lyon, Grand Rapids, Mich.

LUMINOUS Paint. Make objects in your home luminous! Send \$.25 in stamps or coins, for vial of 10 C.C. J. L. Kavanau, 1999 Calvert Ave., Detroit, Mich.

KNOCKDOWN furniture, lumber, plywood, veneers. Illustrated catalog 10c. Giles-Kendall Co., Decatur, Alabama.

BUILD gifts in Birdseye Maple. Write Riley Novelty Shop, Grandville, Mich.

15 FULL-SIZED lawn ornament patterns 30c. Modern Woodcraft, Saginaw, Mich.

MAHOGANY, Pine, Hardwood; Save up to 60%. Metima Lumber Co., Box 83, Hillside, N. J.

WALL Shelves, Novelties, Windmills; Sample prints, 15c. L. Bazuin Co., Grand Rapids, Mich.



SUFFICIENT cedar for chest sixteen by eighteen by forty. \$4.40, freight paid. Sportswood, Ironton, Mo

#### INVENTIONS WANTED

"WORKING With Bentonite"? (Hycoloidal Clay). Amateur scientists and investigators we will aid or buy any new developments you have involving Bentonite Clay. For free samples and further information write: The Wyodak Chemical Co., Department F, 4600 East 71st Street, Cleveland, Ohio.

PRACTICAL Inventions Wanted. Full protection guaranteed. Write for "4-Point Service" bulletin. R. & S. Engineering Company, 17 East 42nd Street, New York, N. Y., Dept. S-12.

SMALL inventions wanted by manufacturers. I'll help you sell your invention. Write for free circular. S. Hull, 7829-M Euclid Avenue, Cleveland, Ohio.

WANTED. Meritorious patented, unpatented inventions. Booklet free. Invention Reporter, 3B-11236 South Fairfield, Chicago.

INVENTIONS. Patented, unpatented, bought outright, royalty. Write, Arellano-Power Co., Box 1827-S, Chicago.

#### MACHINERY, TOOLS & SUPPLIES

ATTENTION: Experimenters, craftsmen, inventors: You need this giant ten pound hardware kit. Big box full of screws, nuts, washers, gears, springs, rivets, brackets, etc. Over 100 parts; price \$1.49; worth \$7.50. Guaranteed satisfaction. Manufacturers Screw, 223 West Illinois, Chicago.

SOUTH-BEND 9" Lathe milling attachment, universal movement, \$9; threading dial indicator, \$3; circular free. Unique Manufacturing Co., 4807 No. 31st Ave., Omaha, Nebr.

ONE inch chrome precision micrometer, \$1.15. Send for free 1939 illustrated tool booklet. Homecraft Tool, 236 Neptune Ave., Brooklyn, N. Y.

BARGAINS, demonstrators, electric arc welders, guaranteed, 30 days trial and terms. Write Hobart Welder Exchange, Box P-192, Troy, Ohio.

#### MAGIC TRICKS, PUZZLES, JOKER NOVELTIES

LOOK! Joke goods! Pocket tricks! Unusual novelties! Strange curiosities! Startling magic! Thrilling puzzles! Lowest prices. Complete line. Send 25c for Giant Surprise Catalog. Free trick included. Lawson Vick Co., Dept. 13, Queens Village, N. Y.

KNIFE throwing secrets exposed! Beginners and experts get this book now! 40 tricks and throws used by professionals. \$1.00 postpaid. Frank Dean, 1294 E. San Fernando St., San Jose, Calif.

SPECIAL! \$1.00 assortment magical equipment, tricks, puzzles, with 200 page catalog, 25c postpaid. Oaks Magical, Oshkosh, Wis.

BARGAINS, Magic! Full line bought, sold, exchanged. Write what have or want. H. E. Powers, 3 Birch Apts., Charleston, W. Va.

FREE! Magic Catalog 500 tricks. Amaze. Mystify friends. Write today! Lyle Douglas, Station A-1, Dallas, Texas.

LARGE Magic Catalog 25c. Over 600 Tricks. Established 1910. Chicago Magic Co., A-2300 North Mason, Chicago.

FREE tricks! Join Magicians' Fraternity! Monthly magazine, sample 10c. International Magicians, Mt. Morris, Ill.

MAGIC: Books, Occult; Novelties; Catalog 10c. Easterncity Sales, 8-EA Randolph, Chicago.

LEARN Fire Eating, Ventriloquism, Torture Acts. Manley, 1315 Ferris, Los Angeles.

LARGE Professional magic catalog, 25c. Holden, P-220 W. 42nd St., N. Y.

MAGICAL coin and large magic catalog 25c, coin. Gem, D-26, Wollaston, Mass.

#### MANUFACTURING

LAM-A-FAB, the cloth cement, acid and waterproof. Permanently repairs anything made of cloth. Sails, hunting suits and equipment, football suits and athletic equipment, rugs, canvas chairs, work clothing, etc. S. J. Russell Co., Box 187, Peoria, Ill.

COMPLETE manufacturing service. Metal articles developed, models, Dies, stampings, wire forms, spinning, assembling, free warehousing. Southern Products, M139, Independence, Mo.

INVENTIONS manufactured in any quantities. Tools, dies, metal stampings; working models built; industrial designing. Complete blue print and engineering service. Write for "4-Point Service" bulletin. R. & S. Engineering Company, 17 East 42nd Street, N. Y. C., Dept. SM-12.

ANALYSIS, Research. Newest guaranteed formulas. Biggest catalog free. Special prices, leads. Gibson Laboratory, Chemists, FE-1142 Sunnyside, Chicago.

MAKE Money manufacturing building material. Low in cost, permanent, attractive. Big growing market. Machine \$25.00 up. Equipment Co., Holland, Mich.

#### MISCELLANEOUS

500,000 USED correspondence courses and educational books. Sold. Rented. Exchanged. All subjects. Satisfaction guaranteed. Cash paid for used courses. Complete details and bargain catalog free. Send name. Nelson Co., 3613 Manhattan Bldg., Chicago.

SWAP Or sell articles you don't need for those you want. Send dime for Swappers Guide listing articles from all over United States. Dept. PS, Swapper's Guide, Delphos, Ohio.

WANTED: Cigarette cards issued prior nineteen hundred. Write Edwards, Box 414, Beverly Hills, Calif.

REMOVE warts with Vlemink's solution. Formula 25c. Prewitt, Box 181, Danville, Ky.

ACCURATE slide rule, 40c. Instruction book, 10c. Jayel, 10 West 47th Street, New York.

FREE literature how to locate buried treasure and minerals. Fisher Laboratories, Palo Alto, Calif.

HAND turned hollow woodenware. Price-lists. James C. Brown, Painesville, Ohio.

#### MODELS & MODEL SUPPLIES

ALL finished parts for constructing positively 100% exact and accurate 36 inch miniature duplicates of the huge TWA twin Motor air liner, guaranteed perfect \$3.25. Arnold Novelty Co., Holland, Mich.

STEAM locomotives!  $\frac{1}{2}$ " scale. Build one by "Easy Steps." Our illustrated catalog lists all needs, 25c. Little Engines, Wilmington, Calif.

PLASTICS, brass, aluminum, monel, stainless steel, supplies in small quantities. Catalog 10c. Hobby Supply House, Box 2014, Pittsburgh, Penna.

CATALOGUE of over 40 engines—castings—supplies, 25c. Refunded. Howardco, P-2417 North Ashland, Chicago.

MODEL Railroad shop, Dept. PS. Dunellen, New Jersey. New 24 page illustrated catalog 10c postpaid.

MODEL Auto Racer Kit 35c. Airplane, Ships, Railroad Kits. Supplies. List 5c. Northern Aircraft, Manitowoc, Wis.

IDEAS Developed, models constructed. Moderate prices. D. Arzic, 5213 So. Kenneth Ave., Chicago, Ill.

MODEL Ship, yacht, speedboat supplies. Catalog 10c. Welcher, Fulton, N. Y.

RAILWAY models. Catalog handbook 25c. Walthers, 259 E. Erie, Milwaukee.

#### MONEY MAKING OPPORTUNITIES

MAN in each town to Plate Auto Parts, Reflectors, Bicycles, Fixtures, Mirrors, by late method. Simple plan of manufacturing at home starts you in good paying business. Free particulars and proofs. Gunmetal Co., Ave. G., Decatur, Ill.

EASY MONEY. Formula for making the Best Penetrating Oil and Rust Removal on the market. Two in one. 300% Profit. Direction For making and Selling only \$1.00. W. A. Farnsworth, 801 W. Main St., Bellevue, Ohio.

MOULDS, guaranteed, for casting toy soldiers, Indians, trappers, warships, sinker moulds, 244 kinds. Send 5c for illustrated catalogue. Henry C. Schiercke, 647 Spencer, Ghent, N.Y.

MILLIONS Jobless! Get dollars in mail for satisfying employment information. Keep dollars! We fill your orders. Details for stamp. Co-Operative Service, 77 Swan, Room 213, Buffalo, N.Y.

\$10.00 DAILY at home, no canvassing, making rubber moulds and casting beautiful artistic novelties. 15c material makes \$2.50 mail order seller. Finart, 197 Van Rensselaer St., Buffalo, N.Y.

TELLS How! 25c brings my coin buying list. Immediate steady profits. Eugene Morrison, Culver City, Calif.

"RAISE Earthworms for Profit" Information Free. Stamp Appreciated. Bureau Zoological Research, 106 P Broadway, Peoria, Ill.

YOU'LL Like Resilvering Mirrors, Auto-parts, Reflectors, Making Chipped Glass Signs. Write Sprinkle, Plater., 920, Marion, Ind.

CANDY and Peanut Vendors: Opportunity to start pleasant profitable part-time business. Eamco, 350 Mulberry, Newark, N. J.

OPPORTUNITIES! Hundreds of money making plans, ideas, etc. Unusual offer. Send for free details. Fox, 608 Rogers Ave., Brooklyn, N. Y.

MAKE money growing plants in water indoors during winter. Weighed chemicals, instructions, formula, \$1.00. Gordon Laboratories, 509-W Fifth Ave., New York.

COSTS few cents, saves dollars; make anti-freeze, glass-cleaner, soaps, polishes, etc. Twenty formulas, \$1.00. Gilbert Foster, Hilliards, Ohio.

YOUR name—5,000 mailing lists—25c. Get samples, opportunities galore from all over world. Pines's, 583 Monroe, Brooklyn, N. Y.

"NEW Money Makers" Magazine, presents novel business-building ideas monthly. Sample copy 10c. Marvin Studios, Publishers, 203 S. Dearborn, Chicago.

RAISE your income with Raises Gold. Success guaranteed or money refunded. Sample 25 cents. Lock, 1476, Washington, D.C.

\$50.00 WEEKLY making new, delicious glazed donuts. Potato chips. No capital. Instructions \$1.00. 3654 Ave A., Council Bluffs, Ia.

10c BRINGS Latest Copy Our Big Magazine of Money-Making Tips, Ideas, Opportunities. Dixie Publishing Company, Station-B, Greensboro, N. Car.

205 MONEYMAKING Opportunities, today's conditions. Your own business, home, office, etc. Introductory booklet free. Stamforde, 3762-M Broadway, New York.

INVENTION Finance Magazine 80-N Wall Street, New York. Free particulars concerning contents of magazine given to prospective subscribers. Inquire at once.

EMERGENCY! Need extra money. Ten ways, Spare time. Anyone. No experience. 25c complete information. Swan System, 509-5th Avenue, New York.

INVESTIGATE: Practical Ways to Earn More Money. Full or Spare Time. Interesting Literature free. H. Frerichs, Hartington, Nebr.

SUCCEED with your products. Make-Sell them. Formulas. Processes. Accurate Analyses. Catalog free. P. Thaxly Company, Washington, D. C.

AFTERNOONS Free! \$300 mo.—home! No canv. Expect surprise! Folio, Sta.-D, Los Angeles.

97c PROFIT mailing letters from your home. Letters furnished. Send for full details. Ps. Kohn, 506 W. 45th, Chicago, Ill.

50 DIFFERENT "Money Making Publications." 25c. Raymond Gilmore, Box 54, Canton, Conn.

25c SENT to Vixon, Winton, Cincinnati, Ohio, Box 51, Starts you in Mail Order Business.

BRUSHLESS, false teeth cleaner, formula \$1.00. Large sample 25c silver. Walsh, 248 Whittenton St., Taunton, Mass.

68-PAGE Booklet. Over 300 tested money-makers, 25c. Literature free. Hampton, Beechwood, Rochester, N. Y.

DICE Game Secrets. Sensational booklet explaining Percentages, etc. 50c. Denby Toole, 610 St. Joseph, Evansville, Ind.

BUILD Lead smelter cheap. Big profits in junk batteries. Plans, information, \$1.00. Excelsior Press, Box 182, Mar Vista, Calif.

DIME Brings Our Salesman six months. Sunflower Mailers, 1200 Mathewson, Wichita, Kan.

PROFITABLE Factory Secret (clock doctor). McPherson, Box 691, Middletown, Conn.

PRACTICAL money making plans; literature free. Silvester, LB217, Old Bridge, N. J.

EARN money addressing envelopes, circulars, typing. Information 10c. None free. Ace-PSMI, 323 Empire, Birmingham, Ala.

DOLLARS In Mail Daily. Your Orders Filled Free. Details. Albert Burk, Norwalk, Ia.



**DOLLARS** in doughnuts; plans for making 20 kinds \$2.00. Cook, Box 31, Swampscott, Mass.

**MAKE Money** Mailing Letters. 75c Profit Possible On Each Letter. McCants Service, Weslaco, Tex.

**PENNIES** In Hamilton scales produce assured income without canvassing or selling. 1910 Vermont, Toledo, Ohio.

**NEED More Money?** Operate home business, literature, stamp. Demonstrators, 1747 Harrison, Chicago.

**\$1.00 HR.** Easy Cleaning. Clocks, watches, Beginners. Instructions, with cleaner. \$1.00 Postpaid. Bill Reif, Lockport, N.Y.

**"RESULT Getter,"** magazine, 1618 East Lucia, Louisville, Ky., publishes money making opportunities, copy 10c.

**OPERATE Profitable "route"** four compartment vendors. Small investment. Penny King, 1233 Chouteau, St. Louis.

**90% PROFIT** mailorder opportunities. Literature free. Harvey Teeple, Decatur, Ind.

**NEW, different, mailorder plan** 10c. Ray Barnes, Cornwall-on-Hudson, N.Y.

**300 TESTED** Moneymaking Plans 25c Catalog 3c. Morrelle, 159-Nob State, Chicago.

**YOUR Opportunity,** mail order information, dime. Box 58, Huntington, Vt.

**DOLLARS** in every Mail. Particulars Free. Harvey Teeple, Decatur, Ind.

### MOTION PICTURES & SOUND EQUIPMENT

**CHROMOFILM!** Guaranteed finest quality reversal! Full Orthochromatic! Weston 8! Complete processing included! Two 30ft. Univex Reels \$1.00! Two 25ft. "Double 8" Reels \$1.90! Postpaid! Order now! Chromofilms, 156-C Springfield, Rutherford, N.J.

**8-16MM. ALL** subjects, silent and sound, sale, rent and exchange. Films rented everywhere. Free illustrated catalogue. (With sample film 10c). Garden Exchange, 317 West 50th, New York

**MOVIE Titles:** Make them yourself quickly. Perfect lettering, with the Master Printer. Complete with supplies \$4.50. Write for illustrated catalog. The Technygraph Master Printer Division, Techny, Ill.

**CHRISTMAS** film complete, 16mm \$1.85, 8 mm 98c. Order today. Movie cameras, projectors, films, accessories. Free lists. Home Movies, Box 216S, Easton, Pa.

**HOLLYWOOD** Titles made easy. Trace. Artistic Titling Charts, \$2.00 complete. Samples, 3c. Stein Studios, 949 Broadway, New York.

**16MM. CAMERA** \$19.50, 16mm. motor driven projector \$3.50, 8 and 16mm. films. Stamp for catalogue. Excel, 622 Madison, Toledo, Ohio.

**GENERA** Movie Films, 100 feet double 8mm. \$1.75. 100 feet for Univex \$1.00. Postpaid. Sample free. Process with powders. Fromaders, Davenport, Ia.

**TITLER** Lens, 8mm, 16mm. Complete with instructions and drawings for making titler, only 75c. Velotex Laboratories, Gary, Ind.

**35MM ROLLS** developed in "Micro-Grain 85" and 3 1/2x5 enlargements. All for \$1.00. George Herbert, Photographer, 600 E. South Michigan Ave., Chicago.

**LEARN** Motion Picture Theatre Management, Advertising, Projection. Free catalog. Give age. Theatre Institute, 375 Washington, Elmira, N. Y.

**8MM-16MM** Home Movies. New subjects monthly. Send for free list today. Crown Film Corp., E42 Melrose St., Boston, Mass.

**BEST** Camera Film; 16mm, 100 feet, \$2.39. 50 feet, 8mm, \$1.37, processed free. Goodwill Company, Jackson, Tenn.

**8-16MM. TITLES,** 2c word. Literature free. Cine Shop, 1812 Piedmont, Charleston, West Virginia.

**PROJECTOR** Film, 16-8mm, sample 10c; lists free. Goodwill Company, Jackson, Tenn.

**35MM. ROLLS** fine grain developed free. 36 enlargements 3 1/2x5, \$1.00. Photoshop, Linton, Ind. Cartridge reloaded 35c.

**BEST** movie prices. Write Pennsylvania Photo, Box 423-C, Williamsport, Penna.

**35MM SILENT** Rented 50c weekly. Calderara, 5119 South St. Louis, Chicago.

### MOTORCYCLES, BICYCLES & SUPPLIES

**ARIEL, B-S-A, Norton, Rudge, Triumph** and Velocette motorcycles completely described in our large illustrated pamphlet.

Send 10c now, and we include the Pink-O-Gram for one year. Reggie Pink, 2077 Southern Boulevard, N. Y. C.

**RECONDITIONED** Motorcycles. New-used parts for all makes. Authorized Harley-Davidson Dealer. Whitman Motorcycle & Supply Co., 405-9 Southwest Blvd., Kansas City, Mo.

**ALLOY** Pistons \$3.00; Indian, Harley, Henderson, Excelsior, Cleveland. New and used parts for less. Cylinder grinding Catalogue and wings pin 10c. Ballak, 1115 Che-nut, St. Louis, Mo.

**SEND 15c** for Illustrated Used Motorcycle Catalog. Bargains. Largest stock, genuine Indian Parts and Motorcycles. Indian Motorcycle Sales, Kansas City, Mo.

**MOTORCYCLE** bargains, lowest prices, bargain sheets for stamp. Motorcycle accessories. Rochester Harley Davidson Corp., 131 W. Main St., Rochester, N. Y.

**THOUSANDS** building own motor scooters! We supply parts. Literature dime. Drawings free. Comet Cycle Co., Box 3032, Madison, Wis.

**MOTORCYCLES** Shipped Direct. Rock-bottom wholesale prices. All makes and models. Dime brings latest lists. Crandall-Hicks Co., Boston, Mass.

### MUSIC, MUSICAL INSTRUMENTS

**WANTED** original poems, songs, for immediate consideration. Send poems to Columbian Music Publishers, Ltd., Dept. 96X, Toronto, Canada.

**LATE** Phonograph records. Goodman, Dorsey, etc., some new, some slightly used. Fifty, \$2.50. Davis Sales Company, Syracuse, N. Y.

**ORIGINAL** Music composed to your words, \$5.00. 200 printed copies \$10.00. Reginald Belcher, Chatham, New Jersey. 30 years church organist.

**VIOLINS;** Deep, mellow, soulful, on Credit. Easy terms for wonderful instrument. Get details today. Gustav P. Henning, Fischer Studios, Seattle, Wash.

**SAXOPHONISTS:** Latest invention. Attaches to reed. Improves tone. 3 for 25c. Ovaltone, 126 Lexington Ave., New York, N.Y.

**HAWAIIAN** Steel Guitar Players Honed Wound Strings, 25c Each. Factory Price. Prepaid. Dynamic String, 2118 Woodbine, Oakland, Calif.

**LEARN** swing piano! Postal brings free folder. Christensen, 765 Kimball Hall, Chicago.

**VIOLINS.** Handmade masterpieces, best since Stradivarius. Lehto, 935- 14th San Pedro, Calif.

**VIOLIN-making** supplies, patterns, instructions. Free catalog. Fraser, 2025 Stark, Saginaw, Mich.

**ORIGINAL** Poems, Songs Wanted Immediately for Publication. Westmore Music Corporation, Dept. 55G, Portland, Ore.

**SONGS** Arranged. Prompt. Efficient. Moderate. Reliable. Len Fleming, Wellsboro, Pa.

**PHONOGRAPHS,** Parts, Supplies, Portables \$4.95. Records 6c. Epsteins, A50 First St., New York.

**SIMPLIFIED** Swing Courses! Accordion, Saxophone, Clarinet, Violin. Swingmaster, 1259-W Bender, Cleveland, Ohio.

**DANCE** orchestrations; sheetmusic. 15-\$1.00. Silverman Musicmart, 3303 Lawrence, Chicago.

**ELECTRIC** Guitar plans \$1.00. Simple easy pick-up and body. Guitar Laboratories, 4000 Garfield, Kansas City, Mo.

**PIANO** By Ear. Free particulars; no obligation. Day-V-Way, 200 Woolworth Building, Dearborn, Mich.

**SONGS,** Poems, bought composed published. Royalty. Free advice. Metro-Melody Music Publishers, San Francisco.

**SONGPOEMS** wanted. We publish. Free Melody. Songland, "PS," Thomaston, Me.

### OLD GOLD, WATCHES, ETC.

**GOLD.** \$35.00 ounce. Ship old gold teeth, crowns, jewelry, watches; receive cash by return mail. Satisfaction guaranteed. Dr. Weisberg's Gold Refining Company, 1502-G Hennepin, Minneapolis, Minn.

**CASH** by return mail for antique jewelry, discarded watches, gold teeth. Satisfaction guaranteed. Write. Lowe, 1208-PS Kesner Bldg., Chicago.

**WATCHMAKERS'** Supplies, tools, watches, jewelry. Sold, purchased. Ben Segal Company, 5 South Wabash, Chicago.

### OPTICAL

**TELESCOPES,** Microscopes, Accessories, Lenses, Prisms. Optical Work to Order. Catalog. Lusk, 1238 W. 39 St., Los Angeles, Calif.

### PATENT ATTORNEYS

**INVENTORS:** send immediately for your copies of our new free books, "Patent Protection" and "Suggestions on Selling an Invention." Sixty-eight pages of interesting facts. They tell how Patent Laws protect you; kind of sketch or model needed; simple steps to take without cost; how successful inventors have secured financial assistance; show interesting inventions; illustrate important mechanical movements. With books we also send free Evidence of Invention form to help establish date of disclosure. Prompt service, reasonable fees, special deferred payment plan. Strictest secrecy. Forty-one years' experience. Highest references. Write us today. The facts in our books are worth money to the man with a good invention. Address: Victor J. Evans & Co., Registered Patent Attorneys, 108-A Victor Building, Washington, D. C.

**PATENTS.** Before too heavy an outlay of time or money is made on an invention, a search of the Patent Office records should be made to determine as nearly as possible whether or not the same idea has been patented before. The cost of this search is small, while the value of the facts it uncovers is often considerable. We offer inventors and manufacturers a thorough, prompt, confidential search service—plus experienced counsel and assistance in every phase of Patent and Trade-Mark practice. Write for our new free book containing valuable information relating to patent procedure. Clarence A. O'Brien and Hyman Berman, Registered Patent Attorneys, 697-P Adams Building, Washington, D. C.

**PATENTS.** Send sketch, photos or model and description of your invention for preliminary search and patentability report. Total expenses, including search fee, for preparing, filing and prosecuting your application quoted before you proceed. Rates reasonable. Prompt and efficient services. Lynwood B. James, Registered Patent Attorney, Established 1913, Suite 843-B National Press Building, Washington, D. C.

**PATENT** Your Invention with this responsible firm established in 1875. Free books answer all questions. Patent facts clearly explained. Easy budget payment plan. Write today for free copies of our booklets and "Certification of Invention" form. C. A. Snow & Co., Registered Patent Attorneys, 216 Snow Building, Washington, D. C.

**MANY** inventors will be interested in my service. Information on subject of obtaining a patent and marketing an invention can be supplied without charge. Immediately communicate with Hugh E. Mc Morrow, Registered Patent Attorney, Dept. 201-C, Barrister Bldg., Washington, D. C.

**"INVENTOR'S** Guidebook" containing 96 mechanical movements and advice about patenting, selling inventions, also "Record of Invention." Free. Frank B. Ledermann, Patent Attorney-Engineer, 154 Nassau Street, N. Y.

**WE** successfully sell inventions, patented and unpatented. Write for proof and tell us what you have for sale. Chartered Institute of American Inventors, Dept. 3-B, Washington, D. C.

**INVENTORS—**send for free copy my 72-page book on patents. Reasonable terms. Prompt action. Confidential, personal service. L. F. Randolph, Dept. 340-A, Washington, D. C.

**PATENTS.** Protect your idea by securing free "Proof of Invention" folder. Exceptional personal service. Established 1908. E. E. Vrooman, 888 Woodward Bldg., Washington, D. C.

**PATENTS—**trade marks. Preliminary advice, book and disclosure form free. Personal service. Irving L. McCathran, 1050 International Bldg., Washington, D. C., Registered Patent Attorney.

**PATENTS:** Personal, confidential services at reasonable cost. Preliminary information furnished without obligation. John B. Thomas & Co., 902 F St., N.W. Washington, D.C.

**PATENTS—**Booklet free. Highest references. Best results. Promptness assured. Watson E. Coleman, Patent Lawyer, 724 Ninth St., Washington, D. C.

**KARL A. Mayr,** Pat. Atty., Reg. U. S. and Can. Patent Office. Engineer. Patents, designs, trademarks; also foreign matters. 21 E. 40th, New York City.



"PATENT Particulars" and blanks, free. Government-registered patent attorney 33 years. Sterling Buck, P-629 F-Street, Washington, D. C.

BEFORE you take any steps write for our 4-Points of Service for Inventors bulletin. R&S. Engineering Company, 17 East 42nd Street, New York, N. Y. Dept. SP-12.

#### PATENTS FOR SALE

HAVE perfected number of coin controlled mechanisms, both semi-automatic and automatic type, suitable for use in vending machines and the like. Also number of drafting devices. Communicate with A. Williams, 435½ Clason Ave., Brooklyn, N. Y.

THOUSAND reputable buyers of inventions with instructions, sales letters, contracts, and royalty forms. Postpaid \$5.00. Inventors Guild, Houston Building, San Antonio, Tex.

HAVE invention with universal market, low cost, big demand. For particulars write to Karl O. Gober, 132 Wildwood Ave., Piedmont, Calif.

NEW Cooker. Amazing invention. Reasonable. J. Stevens, Valley City, North Dak.

MILLION Dollar newspaper improvement. Need finances. I. Hicks, Centralia, Mo.

#### PERSONAL

WIN Prize Money: Booklet, "Successful Contesting" shows how. 10c postpaid. Bulletin listing \$200,000.00 prizes included. World Publishers, 4515-L Cottage Grove, Chicago.

SICK? Large health chart for bathroom or office instructs family instantly. Only \$2.00. Formerly \$15.00. Runyon, Box 1608, Hollywood, Calif.

ARE You deaf? Abell's artificial ear drums are recommended. Write now for free booklet. Dr. Abell, Slavin Bldg., Pasadena, Calif.

DIVORCES. Consent, few days; others 30. American Attorney, Box 1736, El Paso, Texas.

IF a victim of sinus or catarrhal infection, write National Laboratories, 577 Benj. Franklin Station, Washington, D. C.

THE Science of Hypnotism. One dollar. Banky Sales Co., Box 385, Chappaqua, N. Y.

LEARN ventriloquism, 3c stamp brings particulars. Smith, Room 703, 125 N. Jefferson, Peoria, Ill.

\$400,000.00 IN cash Prizes! Be a Winner! Contest Monthly shows how. One sample 10c. Contest Journal, Brookhaven, Ga.

FOR indigestion, sour stomach, dyspepsia; famous doctors prescription, 50c coin. McConnell, 1819 Edgewood, Racine, Wis.

#### PHOTO FINISHING

IMMEDIATE service! Better pictures. Sixteen guaranteed prints from roll, 25c. One colored or two Plain Enlargements and 8 guaranteed prints 25c. Sixteen reprints only 25c coin. Candid rolls developed free! Prints enlarged to 3x4, only 4c each. One day service. Details and mailers free on request. American Studios, Box PS, LaCrosse, Wis.

ROLL Filmachine developed and your choice of (1) 8 finerfotos and 2 professional bromide enlargements; or (2) 16 guaranteed finerfotos or (3) 8 finerfotos and one beautiful oil colored enlargement 25c coin. Order by number. Finerfotos, Box 898-18, Minneapolis, Minn.

MAIL your rolls to film center of the world. Any 6 or 8 exposure roll developed and printed 25c coin. DeLuxe enlargement coupon free! Photo Finishing Shop, Est. 23 yrs., 500 Genesee Valley Trust Bldg., Rochester, N. Y. "The Camera City."

PROMPT service—quality work. Two beautiful double weight Gloss Enlargements, eight guaranteed neverfade prints, each roll 25c. Excel Photo Service, Dubuque, Iowa.

SIXTEEN sparkling prints, 2 Hollystyle enlargements with roll developed 25c. 20 reprints 25c; 100, \$1.00. Photographic Christmas cards, 10 for 49c; Sample, 5c. Lifetone Studios, A-30, Des Moines, Ia.

THREE 5"x7" Enlargements 25c, 8"x10" each 30c, two for 50c. Send coin with negatives. Morrisania Photo Service, 1270 Gerard Avenue, N.Y.C.

FREE, 4 big enlargements—8 prints every roll 25c. 20 reprints, 25c; 42, 50c; 100, \$1.00. Filmco, Albany, Wisc.

GUARANTEED. Roll developed, 16 prints 25c. 20 prints 25c. Quality Photo, Hutchinson, Kansas.

FOR the discriminating amateur, roll developed and carefully printed 25c; reprints 3c. Superior workmanship, same day service. Paramount Co., 327 E. 92nd St., New York.

EXPERT miniature film developing. Very fine grain. Best 20 pictures 3x4 Kodabrom enlargements \$1.00. Reprints 4c. Regular rolls 8 prints 2 enlargements 25c. Expert Studios, LaCrosse, Wis.

FREE album and negative file and 2 enlargement coupons with each roll developed, 8 guaranteed prints 25c. Memrlane Studios, General P. O. Box 666 Dept. "S," New York.

BUFF-TONE Enlargements. From your treasured photo, snapshot, or negative 5x7, 25c; 8x10, 50c. Originals returned. Marcin Photo Service, 848 Armbruster, Buffalo, N.Y.

NEW 35mm. FilmFile book. Holds full roll. Locate any frame without removing film. No scratching or dust. At dealers or sample postpaid 10c. Photo Gadgets, Denver.

ROLLS developed, 2 prints each and 2 free enlargement coupons, 25c; reprints 2c each; 100 or more, 1c. Summer's Studio, Unionville, Mo.

ROLLS Developed, Printed, Free Album, Fotosat, Enlargement Coupon, 25c. Reprints 3c. Streamline, Box 5699-H, Cleveland, Ohio.

ROLL developed, two free enlargements, eight glossy prints, 25c coin. 48 hour service. Empire Photo Laboratory, Sea Breeze, N. Y.

FILM Developing Bargain! Quickest Service! Sixteen prints or two enlargements and eight prints each roll, 25c. Modern Studios, LaCrosse, Wisc.

ROLLS developed and two prints each negative, 25c. Twenty reprints 25c. Star Photo Service, G-109 North Dearborn, Chicago.

ROLLS developed, eight prints, two enlargements, 25c. 35mm. rolls developed, enlarged to 3½x5, \$1.50. Reagan, 406 Tenth North, Seattle, Wash.

35mm ROLLs fine grained developed, good shots enlarged to 3½x5"—36 exposures \$1.00. 18 exposures 60c. Ideal Films, Birmingham, Ala.

CANDID special: 35mm rolls enlarged to 3½x4½ \$1.00, 18mm rolls 60c. 3½x4½ reprints, 3c each. Brown Photo Co., 1910-60 Emerson, Minneapolis, Minnesota.

ROLL film developed, 1 print each, 2 enlargements, 25c coin. High class work. Quick service. King's Photo, Box 447, Rockford, Ill.

CONFIDENTIAL developing, two prints each negative 25c. Reprints 2c each. Royal Photos, 3902 North Sixth, Harrisburg, Pa.

TWO beautiful enlargements, eight electrogloss prints with roll developed 25c. Mayfair, Dept. A, Box 261, Toledo, Ohio.

BEAUTIFUL photographic Christmas cards, 75c doz. Send negative and 10c for sample. Hench Studios, Harrisburg, Pa.

SEND 25c and Films for beautiful prints, 116 inclusive. Leonard, 2834 W. 24, Brooklyn, N. Y.

A professional 4x6 enlargement of each exposure. Eight exposure rolls, coin 25c. Wells, Box 2133, Station H, Cleveland, Ohio.

ROLL Developed and 8 guaranteed prints including two enlargements, 25c coin. Super Snapshot, Winona, Minn.

SNAPPY Photo Service, Box 56, Colvin, Syracuse, N.Y. Roll Finished including two enlargements, 25c.

ROLL Developed, two sets prints 25c. Wilkes-Barre Photo Service, Box 64, Wilkes-Barre, Pa.

ROLL, Developed with 16 Velox prints, 25c. Eastern Photo, Milford, Conn.

ROLLS: Developed and printed, 10c. Trial Photo Finishers, Maywood, Ill.

#### POULTRY & FARMING SUPPLIES

ALL Purpose Tractors at factory price. Shaw 2 to 5 horsepower, riding or walking types. Does plowing, discing, harrowing, cultivating; mows lawns, cuts weeds, does hauling; runs belt machinery. Air or steel tires. Three speeds forward and reverse. Thousands in use. Write for free catalog and 10 day trial offer. Shaw Mfg. Co., Dept. PS-1, Galesburg, Kan.

LOW factory prices on electric brooders, batteries, parts, wire fabrics, etc. Free 76 page catalog. Bussey, 5151 West 65th, Chicago.

MAKE money with poultry. Read America's leading poultry magazine for latest information. Three years, \$1.00; nine months, 25c. Poultry Tribune, Dept. C-91, Mount Morris, Ill.

HEADQUARTERS, World Champion Layers. We imported 353,361,364 egg Contest Hens from Australia, New Zealand. Free Educational Catalog shows Customers Profits. Osborne Farm, Box 64, Holland, Mich.

#### PRINTING, MULTIGRAPHING, MIMEOGRAPHING, LABELS

500 LETTERHEADS, Envelopes, Invoices, Statements or Cards, \$1.75. Latest styles, good workmanship. January Special, 500 each of any three items, \$4.95. Mosher, 4933 Ohio, Chicago, Ill.

HAMMERMILL letterheads, 300 8½x11, any color paper and ink; \$1.48 postpaid. Free particulars. Woodruffs, 217D Lewis, Duluth, Minn.

125, 8½x11 BOND Letterheads and 125 envelopes both beautifully printed, \$1.00 postpaid. Benneville, 907 West Roosevelt, Philadelphia.

100 LETTERHEADS, 100 Envelopes, \$1.00. Rag Content Letterheads, 5000, \$13.75; 100,000, \$200. Philipson Press, 531 Gates Avenue, Brooklyn, N. Y.

200 LETTERHEADS And envelopes, \$1.50; 500 each, \$3.00; 1000 either, \$2.95. We print anything; samples, quotations free. National Printing, Cape Girardeau, Mo.

201b. BOND letterheads, envelopes, \$2.75 thousand postpaid. Anything quoted. Modern plant. Irelan Printing Co., Berkeley Heights, Route 7, Dayton, Ohio.

PRINTING designed to please taste and pocket-book. Rush orders our specialty. Samples, state business. Sicoan, 2038 Obear, St. Louis, Mo.

500 LETTERHEADS, envelopes, statements, \$1.50. Richard's Print Shop, 271 S. Grand St., Orange, Calif.

500 EMBOSSED Business Cards or 125 Letterheads, Envelopes \$1.00, 202 Ashland, River Forest, Ill.

CELLULOID Menu Covers 30c, 1000 business cards \$1.00. Celmenco, Box 15 Station "D," Los Angeles, Calif.

LETTERHEADS designed especially for you! Sketch free! Gill Art Service, Huntsville, Ala.

SENSATIONAL low printing prices. Guaranteed work. Samples. Woodprint, Woodstock, Va.

125 BOND Letterheads with envelopes \$1.00. Harhan Press, 5239 George St., Chicago, Ill.

1000 INVOICES, Letterheads, envelopes, \$2.85; 5000, \$8.25. Good printing reasonable. Lonelmpint, Paulding, Ohio.

1,000 2½x4 LABELS, \$1.50; 2x2½ \$1.00. Paramount Press, Atlanta, Mo.

1000 PROFESSIONAL business cards \$1.25. Hamilton, 4341 No. Meade, Chicago.

1000 BUSINESS Cards, postpaid, \$1.00. Superba Print, 912 Towne, Los Angeles.

BOOKLETS, Folders, Size? Quantity? Low Prices. Miller Printshop, Lawrence, Kan.

SPECIAL 1000 Business Cards 98c. Willsons, 2408 Pine, Everett, Wash.

500 TWO-color Stickers, 2½"x7/8". 50c. Fine labels. Cott's, Spickard, Mo.

1000 6¾ BOND Envelopes \$1.95. Samples. Feld, Elmwood Place, Ohio.

COMPLETE 20 Page printing price list, 5c. Nixon, Stevens Point, Wis.

#### PRINTING OUTFITS & SUPPLIES

PRINT your own cards, stationery, circulars, advertising. Save money. Easy rules furnished. Print for others, big profits. Junior outfit \$9.00, job presses \$11 up. Details free. Kelsey Presses, B-8, Meriden, Conn.

PRINTING Presses \$5.00. Type 50c. Catalog. Send Stamp. Bradshaw, 3214-S Huron, Chicago.

SMALL Printers: Get free list shop kinks. Ogg Press, Tampa, Fla.

6x9 PRESS \$5.00. Bargain literature free. Novelty Shop, Downsville, La.

STOCK cuts 40c up. Catalog 10c. Gregor's, 79-S. Main St., Belleville, N. J.

#### PROFITABLE OCCUPATIONS

MINK. Finest easterns and Yukons obtainable. Mink cages, complete \$4.00. Woodall's Mink Farm, East State Street Extension, Barberton, Ohio.

RACCOONS: Greys \$10.00, blacks \$15.00 each. Peter Fleming, Horicon, Wis.



**RAISE** Guinea Pigs, make money. Thousands needed. We supply breeders and buy the young. Free Booklet. Research Corp., 2436 W. York Street, Philadelphia, Pa.

**CHEMICAL-CULTURE.** Grow flowers, vegetables, with chemicals, no soil. Educational. Large yields. Latest formulas, instructions, chemicals, \$1.00. Louran, Box 755, Rockland, Maine.

**SAIL** the high seas. Personal staffs of ocean liners require young men of excellent character. Good pay, board, opportunity to see the world. Details free. Julius, Amarillo, 33, Tex.

**MAKE** Cuts, Print Greeting Cards, Posters, Bookplates. Without Press. Pleasure, Profit. Instructions \$1.00. P. R. Williams, Carmel, N.Y.

**500: SCENTLESS** Skunks: Blacks \$5.00. Stripes \$2.00. Select Quality. Breeders, Pets, Black-Bear, Female, 300 lbs., Tame, \$50.00. Brown's Kennels, White-Hall, Md.

**BIG** Money Raising Angora Wool Rabbits! Easy, Interesting. Wool bring \$3.00 to \$6.00 lb! Catalogue, wool samples 10c. Clay Rabbit Farms, Sharon, Wash.

**MINK** Easily raised. Highly profitable. Free booklet. Horland Banks, Framingham, Mass.

**GINSENG** Growing instructions free. seeds reasonable. Specialty Farm, Rockford, Minn.

**RAISE** Mink, Bred females, April delivery. Dime for general information. Lomman's Fur Farm, Spangler, Pa.

#### RADIOS, SUPPLIES & INSTRUCTION

**DON'T** buy a radio. Get our catalog first listing over 400 nationally known standard make sets. Also 700 electric specialties for the home. Big special, 10 inch phonograph dance records 12 for \$1.00. Write today. Modell's, 51 Cortlandt St., N. Y.

**RADIO** engineering, broadcasting, aviation and police radio, servicing, marine and Morse telegraphy taught thoroughly. All expenses low. Catalog free. Dodge's Institute, Poplar St., Valparaiso, Ind.

**ATTENTION:** Send for free literature describing World's most unusual Midget Radios. Also Table and Console models at factory prices. Tinytone Radio Corp., Dept. CPS, Kearney, Nebr.

**AMAZING** Pocket radio, Plug in light socket, \$2.50. Postpaid. Guaranteed. Small Sets. Sample radio 25c. Engels Radio Service, Route 8, Box 1626, Phoenix, Ariz.

**AMATEUR** radio licenses, complete training. Day and evening courses. Low rates. Home study courses. Results guaranteed. Hundreds of licensed studios. American Radio Institute, 1123 Broadway, New York.

**"CRYSTAL** Detector" Handbook; 3 beginner's plans; "Radiobuilder" year. All for 25c. Laboratories, 7700-T East 14th, Oakland, Calif.

**PORTABLE** Battery radio, operates anywhere. Nineteen dollars. Traileradio, Minneapolis, Minn.

**FARM** Radio (6-tube) \$9.95. 100 Needs. Save 50%. Catalog Free. Marco-E, Kansas City, Mo.

**1939 RADIOS** \$9.95 up. Shavers \$2.98-\$15.00. Slims, Warwick, N. Y.

**NEW** crystal circuit. Selective. 25c. Box 5, Shields, No. Dak.

#### RARE COINS

**BIG** prices paid for certain wanted coins. 1909 cents \$10.00, some silver dollars \$40.00, 1864-1865 Indian head cents \$100.00 each, dimes before 1895 \$600, liberty head nickels before 1914-\$500, encased postage stamps, some large pennies \$2000, half cents-\$275.00, paper money, gold dollars \$1500, foreign coins \$165, some worth \$6000 each. You may have coins for which we pay big premiums. Therefore send 15c today for 1939 big illustrated coin book for certain wanted coins. National Coin Corporation (2), Daytona Beach, Fla.

**COIN** Collectors, Read "The Numismatist." Monthly magazine containing news and features on coins, medals and paper money. Published by The American Numismatic Association. Six months trial subscription \$1.50; sample copy 30c. Write for descriptive circular. Room 233, 99 Livingston St., Brooklyn, N. Y.

**FREE!** Foreign coin, banknote, and large illustrated coin catalogue. Send 4c postage. Coin approvals sent. Tatham Coinco, Springfield-D50, Mass.

**\$5.00 to \$500.00** each paid for hundreds of Old or Odd Coins. Keep all until posted. Send 10 cents for illustrated Coin Value Book, 4x6. Guaranteed Prices. 31 years in business. Coin Exchange, Box 31, Le Roy, N. Y.

**WILSON'S** new United States coin catalog and complete mint record. 50c postpaid. Gives prices dealers pay and ask for all American coins. D. M. Merrin, W528 First, Spokane, Wash.

**COMMEMORATIVE** half dollars, Lincoln, Texas, Oregon, Stone Mountain, Cleveland, \$1.50 each. New illustrated catalogues 25c. Norman Shultz, Salt Lake City, Utah.

**SOMETHING** New. Send 10c for latest 1938 buying list of United States cents, priced according to their condition. American Coin Company, Box 3507-H, Cleveland, Ohio.

**UNCIRCULATED** San Francisco mint cent and list, 10c. 3 different, 25c. Landon, 901 Lucerne, Los Angeles.

**INDIAN** Head and Lincoln cents wanted. Send dime for my latest buying list. Robt. H. Copeland, Olney, Tex.

**WANTED:** Certain Lincoln Pennies. Album and information 10c. Kathen, Cornelius, Ore.

**WILL** Pay 40% premium for gold coins. A French Numismatist, Route 1, Troy, N. Y.

**WE** purchase all Indianhead pennies. Purchasing catalogues 10c. Arnold Spanner, 100 Forsyth, New York.

**CASH** For Gold, Silver and Copper coins. Send list for offer. Charles McLean, Oteen, N. C.

**BEAUTIFUL** collection, 50 different coins, some over 100 years old, \$5.00 postpaid. Mobley, Box 3176, Hollywood, Calif.

**BUFFALO** 1938-D Nickel uncirculated, and catalog of coin bargains, 10c. Eugene Morrison, Culver City, Calif.

**INDIAN** head penny and coin list for dime. Charles Banker, Salina, Kan.

**15 DIFFERENT** coins, 25c. Bishoff, 500 E. 8th St., Kansas City, Mo.

**35 COINS,** Bills, Tokens, Postpaid 25c. Otto Oddehon, Unionville, Mo.

#### RAZOR BLADES

**100 DOUBLE** Edge blades, One Gillette Razor, \$1.00; without extra charge. Copyright Plan. Cigarettes at 69c a carton. J. J. Frank, 525 Palm, Rockford, Ill.

**100 DOUBLE** Edge Blades 75c. Guaranteed. Olsen, 1551 Southeast Powell, Portland, Ore.

#### RUBBER STAMPS, OFFICE SUPPLIES

**SAVE** half! Typewriters, Duplicators, Addressographs, Dictaphones, Check-writers. Terms, 10c per day. 10 day free trial. Write, Pruitt, 278 Pruitt Bldg., Chicago, Ill.

**ENVELOPES,** 1000-6 3/4's, \$1.75; 1000-10's, \$2.85; 100 sheets carbon paper \$1.50 Prepaid. "Everything for the Office." LaBahn, 603 Main, Evanston, Ill.

**RUBBER** Stamps 1-2 lines 25c, three 35c. Cushioned. Augustin Stamp, Fond du Lac, Wis.

**RIBBONS,** Carbons, rubber stamps, office supplies. Roth Printing, Jamaica, New York.

**3 LINE** Stamp 30c; 2000 Business Cards \$1.50. Stamprite, Pewaukee, Wis.

**CUSHION** mounted, 1 or 2 lines 25c, three lines 35c. Stamp Works, Hastings, Nebr.

#### SCIENTIFIC EQUIPMENT

**EXPERIMENTER'S** Encyclopedia issued serially contains data, constructional details, circuits, processes, formulas unobtainable elsewhere. Dime each. Horning, Box 200, Elizabeth, N. J.

#### SONGWRITERS

**SONGWRITERS.** Get free the inside facts on successful songwriting by famous Broadway composer. Write today. Songwriters Institute, 1234-J Broadway, New York.

**WANTED** original poems, songs, for immediate consideration. Send poems to Columbian Music Publishers Ltd., Dept. 96, Toronto, Can.

**SONGWRITER'S** Manual, revealing important information, sent free. Write Standard Song Service, 1412-C Great Northern Bldg., Chicago.

**MUSIC** Composed to words. Rhyming Pamphlet on request. Phonograph recording of completed songs, \$5.00 voice and piano. Send Poem. Keenan's Studios, Dept. PS, Box 2140, Bridgeport, Conn.

**SONGWRITERS:** Send your poem today for immediate consideration. Richard Brothers, 146 Woods Bldg., Chicago.

**SONGWRITERS** wanted, write for free book, 50-50 plan. Song Bureau, Dept. L, Salem, Ind.

**ORIGINAL** Poems, Songs Wanted Immediately for Publication. Westmore Music Corporation, Dept. 55E, Portland, Ore.

**SONGWRITERS!** Outstanding, amazing offer. Hibbeler, C-15, 2157 N. Avera, Chicago.

**SONGWRITERS,** poems, wanted immediately. Glen Warren, 1560 Broadway, New York City.

**SONG,** Poem, Melody Writers. Write Studio PS2, Guaranty Bldg., Hollywood.

#### SPORTING GOODS, GUNS, FISHING TACKLE, ARCHERY

**LIKE** Guns? If you enjoy shooting or tinkering with firearms, send nine cents in stamps for sample copy The American Rifleman, exclusively about guns of all kinds. National Rifle Association, 899 Barr Building, Washington, D. C.

**LEARN** Gunsmithing at home. Repair your own and neighborhood's firearms. Free catalog describing 20 books on firearms and gunsmithing. Tom Samworth, Marines, North Carolina.

**SUBSCRIBE** to the leading archery magazine. Covers all phases of archery. One dollar per year. 10 cents for sample copy. American Bowman-Review, Albany, Oregon.

**HEADQUARTERS** for bows and arrows, materials and supplies. Catalogue Free. Instruction Book 50c. Archery, 617 South State, Chicago.

**HUDSON** Bay blankets, Indian pack baskets, camp stoves, knives, compasses, outdoor equipment. Free catalog. Howe Fur Co., Box PS, Coopers Mills, Maine.

**BOWS,** arrows, accessories, raw materials. Send fifteen cents for catalog. Roy Hancock, 323 Douglas Ave., Portsmouth, Va.

**3000 NEW** Golf clubs, matched Hickory Shafts, Chromium Plated 50c each. Lincoln Surplus, 123 Galena, Freeport, Ill.

**BOWLING,** Boxing, acrobatic shoes, sandals, moccasins, factory prices. Write Smith's, 1305 Wallace, Philadelphia.

**YEW** bowstaves finishes tackle set, matched arrows, \$2.00. Hobson, Salem, Ore.

**DUCK** Stamps. Any year. We pay 15c, 30c each. Robertson Stampco, Nampa, Idaho.

**FLY** tying material, prices free. Work Fly Company, Pueblo, Colo.

#### STAMP COLLECTING

**STAMP** outfit free! Scarce airmail triangle from Mozambique Col! Thrilling North Borneo (Jungle Scene)! Also World's largest ship stamp (picturing Columbus' Fleet) and fine packet other unusual stamps including Georgia (Dead Country!), Sudan (desert scene), a set of the world's smallest stamps—big lists and a watermark detector. All absolutely free to approval applicants sending 3c for postage. Write today. Midwood Stamp Co., Dept. 2R, Midwood Station, Brooklyn, N. Y.

**WE** don't sell the Brooklyn Bridge, but we have on hand a very desirable lot of 1,000 selected U. S. Guaranteed to be included in this lot are 100 before 1900, 200 commems, 2 complete commemorative sets, 200 precancels, 10 Parks, 50 revenues and no current 3c stamps. The price for this gigantic lot is only \$1.00. With the first 50 orders we will include, in addition, 500 foreign stamps from many parts of the globe. Meyerowitz, 1693R-65 St., Brooklyn.

**FREE—The** Stamp Finder! Our new 20 page edition, fully illustrated, which will enable you to instantly identify all difficult stamps. Also fine packet of odd and unusual stamps from Bosnia-Herzegovina, Monaco, Patiala, Eritrea, etc., including maps, ships, animals and strange scenes. All free to approval applicants inclosing 3c postage. Garcelon Stamp Co., Box 918, Calais, Maine.

**CAMEL** Stamp and Airmail. Chance to join big Stamp Club, together with mammoth Stamp packet, 5c. Approvals. Atlas Stamp Company, 413 West 8th, Little Rock, Ark.



**PRODIGIOUS Anniversary Package!** Bi-colored Banana Airmail, Perak, Savage Selangor, Unique "Green Cross" Charity; Wurttemberg "Official"; Kiwi Bird; World's tiniest Airmail, Philippines Rizal, Negri Sembilan, Fantastic Indo, Portuguese Commemorative, Siberia, striking Pictorials, etc. Everything only 5c with excellent Approvals! Saxon Company, Dept. B, 408 Jay St., Brooklyn, N. Y.

**SUPER-WONDER** packet offered containing 60 different stamps from Afghanistan, Transjordan, North Borneo, Manchukuo, Sudan, Guadeloupe, Iraq, Sarawak, French and British Colonies, including natives, beasts, ships, etc.; this entire packet for only 5c to approval applicants. Big illustrated lists free. Kent Stamp Co., Box 87 (11), G.P.O. Brooklyn, N. Y.

**APPROVAL Offer Supreme.** Collection of 120 different stamps including Jubilees, Coronations, Airmails, Map, Australian Savage, Animals, Netherlands Triangle, Costa Rica Diamond, Etc.. Only 10c to serious applicants for really fine approvals. Bill Boyd, Dept. D., 3422 Tuxedo Ave., Cleveland, Ohio.

**GET More, Buy Lots!!** Our famous Dollar Lots contain between 50 and 100 different stamps cataloging over \$5.00. Attractive pictorials, airmails, commemoratives, etc. that you will be proud to exhibit. The perfect Christmas gift! Torgesen, Chestnut, Teaneck, N. J.

**BIG 5c offer!** Consists of Ecuador (large commemorative), Chile, Jamaica, Costa Rica, Australia (Kangaroo), Cuba, Manchukuo, Indo-China, 10 different Peru, and 10 different Mexico. All for 5c to approval applicants. Maynard Sundman, D100, Bristol, Conn.

**1939 ANNUAL Free.** Features Canadians, Newfoundlands, United States, Colonials, Foreigns, Supplies. Sixty pages with Hundreds of Illustrations. Sent Free. Gray Stamp Company, Dept. PR., Toronto, Canada.

**FREE "United States and British North America";** our valuable, complete, illustrated, 64-page catalog quoting lowest prices. Big illustrated list of foreign stamps also included. H. E. Harris & Co., 99 Transit Building, Boston, Mass.

**WORLD'S smallest airmail, free stamp magazine,** \$2.00 U.S., animals, birds, Indian, airplane, commemoratives, scarce stamps 25 countries, 5c with approvals. Capital Stamps, Dept. SM, Little Rock, Ark.

**WONDER Collection:** Packet odd countries, two airmail sets, United States commemoratives, mint British Colonies, triangles, diamonds, 15 Asia, 10 Africa, packet nineteenth century, everything, 5c Wright's 2527-H Guilford, Baltimore, Md.

**SOUNDS impossible!** 120 different, Afghanistan, Azerbaijan, Zanzibar; triangle, diamond stamps; United States commemoratives, Civil War issue, \$2.00, \$5.00 high denominations; everything 5c! Abell's, 1818-H St. Paul, Baltimore, Md.

**UNBELIEVABLE!** 62 different; six triangles and diamonds; airmail, animal, war stamps, China, Japan, Manchukuo, insurgent Spain; Asia, Africa, South Seas. Everything, 5c! Crowder's, 127-H-E. North, Baltimore, Md.

**FREE; 25 Different Japanese Pictorials and Commemoratives.** Valuable Collection of this popular country to approval applicants. Charles Cleaveland, 806 North Humphrey, Oak Park, Ill.

**1897 GRANDE Comore, Kouangtcheouwan, Caymans, Liberian Bongo, Turks Caicos, huge Bhopal Triangle, etc.** Everything 3c with approvals. Viking, 1-P Hanson Place, Brooklyn, N. Y.

**CANNON!** Set of stamps showing cannon, firing squad, cavalry charge and 200 other different stamps, only 10c to approval applicants. Reich Stamp Co., 4647 Kenmore, Chicago.

**SENSATIONAL Offer!** 100 stamps including triangle, airmails, commemoratives, pictorials, colonials, only 5c with approvals. Leo, 853 North Martel, Hollywood, Calif.

**SCARCE Swaziland, three Costa Rica Triangles, and others from unusual lands (no Europe) 5c only to those requesting our Quick Service Approvals.** D. M. Ward, Desk S-2, Gary, Ind.

**FREE! Two coronation sets.** Postage 3c. Roberts, 312U Shearerbldg., Baycity, Mich.

**500,000 STAMPS!** General line approvals. Where? Peterson's, Box 300, St. Paul, Minn.

**DESIRABLE Imperforate miniature sheet** of four Triangular stamps—(extremely limited issue) with 50 different world collection, only 10c. Friendly Philatelists, Box 4428S, Philadelphia, Penna.

**SPECIAL!** 20 different commemoratives to applicants for my fine foreign approvals with stamps 1c and up. Postage 3c. Neils Dolve, 621-15th Ave., Southeast, Minneapolis, Minn.

**HIGH Grade Packets all different:** 100 Yugoslavia, 100 Sweden, 80 Finland, 50 Mexico, 50c each. 300 Worldwide, 30 Estonia, 25 Guatemala, 25 Peru, each 25c. Paul Franke, 140 Wilson, Boonton, N. J.

**DUPLICATES exchanged.** Send 100 and dime. Receive 100 and only stamps White Russia ever issued, ten pictorials. S. Rose, 2855 Claflin Ave., New York, N. Y.

**U. S., Canada, Newfoundland, Mexico:** "Four Star Approvals." Nothing like them! Write today. 312 mixed U.S. only, 10c. Kessels, Tucson, Ariz.

**WAR Torn Spain, 10 Beautiful Commemorative** including Giant Triangle 10c. Approvals, Goldman, 11314 Jerome Avenue, Richmond Hill, N. Y.

**FREE: 25 Diff. Sweden** on request of my "Superior Approval books." Reference please. Knut Norden, 602 Alexander Ave., Winnipeg Man., Canada.

**DESTROYED Hindenburg Zeppelin** (catalogs 35c) Or Spain Nude Duchess, 5c with approvals. Laurence Shultes, Berne, N. Y.

**25 UNITED States, including \$4.00 and \$5.00 stamps free to approval applicants.** 3c postage. Brownie Stamp Shop, Flint, Mich.

**125 DIFFERENT United States, 40 different commemoratives, 75c.** Pound office mixture 60c. Clarke, 1812 Dial, Springfield, Ill.

**STAMP-PACKED wallet:** Diamond-shaped, Cantonese, photogravures, pictorials, etc. Everything 1c. Approvals. Lafal, 91-OIB, 102nd St., Richmond Hill, N. Y.

**CORONATION, Czechoslovakia, U. S. Air Mails, Columbian, 5c with Approvals.** Pomeroy's Brokerage, 115 Valley View Place, Minneapolis, Minn.

**DEAR Mr. Collector, Those Missing Numbers, Those Blank Spaces, Send Me Your Want List.** National Parks Stamp Shop, Gloucester, Mass.

**50 DIFFERENT, Fine U. S. including perforation gauge, 10c with approvals.** The Stamp Shop, 809 Holland Bldg., St. Louis, Mo.

**BRITISH Colonies. All different, 25, .05; 50, 10c; 100, 30c.** Approvals if requested. Wollaston Stamps, Wollaston Sta., Boston, Mass.

**60% DISCOUNT on British West Indies of the Better Grade 19th and 20th.** References. L. S. Myers, 59-39 44th Ave., Woodside, N. Y.

**SOUVENIR Mint Sheet: Tipex 22c, S.P.A. 13c, Byrd 41c, Putzer, 137 Sterling Street, Brooklyn, N. Y.**

**RARE Old New Brunswicktrain Stamp, 15c and Reference with Approvals.** Newberry's, 946 Fort, Victoria, Canada.

**HARD To Get Stamps 1/4 Cat. Many Bargains.** Brown, 333 Second Ave., Lyndhurst, N. J.

**DARWIN Set Complete, Catalogs 85c, with Approvals 10c.** Hecht Co., 5, Belle Plaine, Ia.

**4 GIANT Stamps, 20 South America, 5c, with approvals.** Haworth, Dept. PSM, 4968 Victoria Dr., Vancouver, Canada.

**UNPICKED! 100 U. S. revenues on documents, 10c. (1,000, 60c.)** Vanvoorhels, Hyndman, Pa.

**UNITED States commemoratives, 25 different, 10c.** Applicants General Approvals, Goldsmith, Box 200, Chicago.

**PANAMA Triangle and 50 others free to approval applicants sending 3c postage.** Tatham Stampco, Springfield-D50, Mass.

**U.S. Packet or your choice from foreign approvals included.** Postage please. Wm. Clatworthy, Upland, Calif.

**1000 DIFFERENT \$1.00, 4000 \$10.00, booklet 5000 \$15.00.** Lecomte, Frere Orban, Jumet, Belgique.

**1015 WORLDWIDE Stamps, only 33c.** Postpaid. Menashe, 2804 Verdugo, Burbank, Calif.

**1000 MIXED Foreign, 25c.** Well worth sorting for values. Plaza Stamp Co., Box 1161a, Santa Fe, N. Mex.

**COUNTERFEIT Stamp Free** (catalog \$30.00) to approval applicants. Ralph Tanner, Red Creek, N. Y.

**207 DIFFERENT, including Manchukuo, Cameroons, Mexico, 10c with approvals.** Astor Stamp, 42 Astor, Jersey City, N. J.

**FILLER Uppers, U. S. approvals under nickel.** House Stamps, Box 1039, Redding, Calif.

**EXCHANGE Stamps all countries.** Particulars free. "Exchangers," Bry 918, near Paris, France.

**TWENTY commemoratives, Dime with approvals.** Notro, 4909 North Seeley, Chicago.

**99 ZANZIBAR, Coronation, Tanganyika, etc., 7c.** Luckee, 5018 Pernod, St. Louis, Mo.

**FREE: 50 stamps, Iraq, etc.** Postage 1c, album 3c. Bullard, 268D Northampton, Boston, Mass.

**TRINIDAD And Tobago Coronation, Free!** to approval applicants. F. Conrad, Box 49, Richmond, Ind.

**FASCINATING foreign approval selections! Lowest prices!** Rosenberg 3527 West Adams, Chicago.

**33 DIFFERENT United States 5c.** Approvals. Utechts, 1143 North Keeler, Chicago.

**50 DIFFERENT, U. S. Commemoratives, British Colonies, 15c.** Postage. Scranton Stamp Service, Scranton, Pa.

**25 DIFFERENT South-American 10c, no approvals.** Burkhart Stamps, Sandwich, Ill.

**FIJI Borneo, 23 other British colonial 3c.** Approvals, Porter, Box 863, Springfield, Ohio

**FREE. Packet to approval applicants.** Schramm, 1489 East 19th Street, Brooklyn, N. Y.

**200 DIFFERENT world 10c, approvals.** Hazett Stamp Shop, 701s Fourth, Baycity, Mich.

**PRECANCEL accumulations Wanted.** Highest prices. Cash. L. E. Moore, Little Rock, Ark.

**WORLDWIDE postage stamps, 100 varieties .05.** Approvals. Edgar Meltzen, Fayetteville, Tex

**BRITISH Colonies, Air Mails, Pictorials, 87 different 10c with approvals.** Sachse Stamps, London, Canada.

**410 U. S. COMMEMORATIVES, 45 varieties, \$1.00.** Inland Stamp Service, Box 5642, Chicago.

**300 DIFFERENT Stamps 20c; 1000, \$1.00; 2000, \$3.00.** Fred Onken, 630 79th St., Brooklyn.

**50 DIFFERENT Mint French colonials only 3c to approval applicants.** Colonial Stamp Co., Lemoyne, Pa.

**VALUABLE Premiums with every quarter purchase from my approvals.** Van Ormer, 2269 Cottage Grove Ave., Atlanta, Ga.

**FIJI (scarce) included; Forty Country Mixture, 100 stamps, 10c; 300, 25c.** No approvals. Elzea, Bowling Green, Ohio.

**SCARCE Zeppelin Airmail set cataloging 85c.** Only 10; to Approval Applicants. Riedell, Greensburg, Pa.

**EARN cash, stamps.** Sell my approvals—nickel packets. Elliston, 2841 W. 37th St., Brooklyn, N. Y.

**50 WORLDWIDE different, 3c; approvals.** Gordon-co, B-178-PS, Downers Grove, Ill.

**300 DIFFERENT 20c; 500, 35c; 1000, 90c.** Spears, 934 Blake Ave., Brooklyn, N. Y.

**BEST one cent approvals in America.** Elvin Stanton, Niantic, Conn.

**FREE King Edward VII set.** Jack Reed Jr., Houtzdale, Pa.

**SMASHING Stamp Bargains Free.** Herget, 553 Suffolk, Buffalo, N. Y.

**PENNY Approvals that please.** Haywood, 395 Adams St., Pomona, Calif.

**5 AIRMAILS, 45 others, 3c.** Altone, 2068 Daly, Bronx, N. Y.

**200 DIFFERENT Foreign Stamps 10c.** Monjar, 1542 Waverly, Cincinnati, Ohio.

**1000 UNITED States, 25c postpaid.** Schell, 127 Rose, Reading, Pa.

**EGYPTIAN Airmail Set 5c with Approvals.** Scheblein, Rosedale, N. Y.

**ATTRACTIVE U. S. Approval Selections.** A. Grove, 306c Blanchard, Seattle, Wash.

**FREE, 25 different United States.** Schultze, 55F, Woodhaven, N. Y.



U. S. Mission mixture. 50c pound. Stamps, Box 64, Racine, Wis.

91 DIFFERENT United States 25c. Reiter-Imhoff, 111 W. Jackson, Chicago.

BRAZIL, 50 Different 10c with bargain approvals. Davis, Silver Lake, Ind.

50 DIFF. Peru, 25c (coin). Fanter, 6452 Robin, St. Louis, Mo.

PENNY Approvals, that satisfy. Neil Gronberg, Box 54418, Philadelphia, Pa.

7 ODD Shaped Stamps, Only 10c with approvals. Gaydos, Kenosha, Wis.

SIX different triangles only 10c. Approvals. Eulalia Turner, Azusa, Calif.

FREE samples. Send dime postage. Robert Stine, Louther, Carlisle, Penna.

5 DIAMOND stamps 5c. Barcus, 1631 S. Lincoln, Denver, Colo.

100 ALL different Portugal 25c. LC Trading, Box 38P, Bellerose, N. Y.

#### TATTOOING SUPPLIES

TATTOOING outfits, supplies. Illustrated list free. "Waters," 965 Putnam, Detroit.

#### TOBACCO

SMOKING Goldleaf Burley, Turkish tobacco. Three pounds \$1.15. Postpaid. Belmont Farms, Chatham, Va.

#### TREES, SHRUBS, PLANTS

CACTUS; 12 large blooming size plants, all different, postpaid, \$1.00. Westex Cactus Gardens, Box 624, Cisco, Tex.

#### TYPEWRITERS

NEW vest pocket adding machine. All steel. Chromium plated. Addition, subtraction, multiplication. Eight columns, \$2.50. Illustrated catalog. Slide rules, engineers instruments. 10c. Refunded first order. Agents wanted. Tavella, 33 W. Broadway, New York.

NEW \$3.75 Automatic adding machine. Fully guaranteed. Bassett, Box 302-N, Altadena, Calif.

#### WANTED—MISCELLANEOUS

CASH for used microscopes, binoculars, cameras, slide rules, drawing sets, surveying, mechanical, scientific and musical instruments. Highest prices paid day shipment received. Satisfaction guaranteed or shipment promptly returned. Elman's, 2300-PS VanBuren, Chicago.

WILL Buy unused United States stamps. Small discount. What have you? Mint Sheet Brokerage Co., 423 Caxton Building, Cleveland, Ohio.

OLD Radiator emblems bought, exchanged. H. Stockwell, Hutchinson, Kan.

WANTED. Automobile nameplates. W. Emmert Swigart, Huntingdon, Pa.

#### WELDING, SOLDERING

75-200 AMPERE arc welders from Dodge generators. Complete plans 35c. 100 other generator changes. LeJay Manufacturing, 323 LeJay Building, Minneapolis, Minn.

NEW Arc welder cheap. Free literature. Holgeron Service, Canton, Kan.

MONEY back guarantee! Alumaweld will solder all metals including aluminum. \$1.25 kit containing 24 inches solder, flux, complete instructions \$1.00. Alumaweld Company, 2442 South Parkway, Chicago.

D.C. ARC-WELDER Plans \$1.00 each. 25-200 amperes from 32 volt Delco light plant. 25-600 amperes from d.c. truck motors. 25-200 amperes from North-east Dodge 12 volt generators. Welders Club of America, WB-3432, M-Mart, Chicago.

CONVERT Model T magneto field coils into 110 volt arc welder. Instructions \$1.00. Superior Welding Company, Box 1892, Roanoke, Va.

DEMONSTRATORS, electric arc welders. Money saving prices. Used by the government. Trial and terms guaranteed. Hobart Welders, Box P-193, Troy, Ohio.

REBUILT a.c. d.c. Arc welders, all sizes; engine governors, idlers. Terms. Low prices. Guaranteed. Service Co., 3732 Cedar Ave., Cleveland, Ohio.

SPOT Welders, heavy \$40.00, light \$16.50; proven efficiency. Gale Hollinger, Glen Ellyn, Ill.

#### WIND ELECTRIC PLANTS

BUILD wind light plant for your cabin. Complete plans and valuable catalog 10c. LeJay Manufacturing, 493 LeJay Bldg., Minneapolis, Minn.

#### WOODS

LUMBER, Veneers, Plywood, Glues lowest prices. Write for Price List. Woodworkers Supplies, Box 133, Neenah, Wis.



## WELDERS WANTED!

**ELECTRIC ARC—OXY-ACETYLENE**  
Skilled Welders earn \$8 to \$15 a day. The demand now greater than the supply. Learn this highly paid trade in 4 weeks by actual shop work. One of America's leading schools. Established 1903. 7 floors of shops. Endorsed by welding industry. Limited number of students. 4 weeks course in Electric Arc or Acetylene Welding, including room and board, only \$159. Write or wire for reservation. Ask for "Welding Facts." State age.

GREER COLLEGE, Dept. 3128, 2024 S. Wabash Ave., Chicago

## DECORATIVE METAL WORK

A brand new manual for the amateur. Tells in easy to understand language how to make useful metal articles in your home workshop. You'll be surprised how easy and interesting metal work really is. Fully illustrated with diagrams and step-by-step instructions. Sturdy cloth binding, 253 pages. Send only \$2.00 and your copy will be sent postpaid.

POPULAR SCIENCE MONTHLY—Dept. 19  
35E-4th Ave. New York, N. Y.

## Ship Model Tricks of Experts

### NOW MADE EASY FOR AMATEURS

Now you can easily make a beautiful to-scale model of a gorgeous four masted galleon, trim racing yacht, or fast ocean liner from the simple plans fully explained with working diagrams in this brand new manual. Join the fast growing group of those who are turning to ship models for their favorite hobby. It's a fascinating way of spending leisure time and a finished model will get many approving looks and words of praise from your friends.

MANUAL OF SHIP MODEL MAKING tells you how to make any model. Step-by-step instructions that will help you select and make your tools, shape your hulls, build your deck fittings, and apply your rigging and sails. All about small parts—deck houses, stanchions, steering wheels, pumps, ladders, spars, yard and mast fittings, deadeyes, blocks, fretwork, finishing, decorating, etc. Trick methods, short cuts, kinks, and time-saving methods of experts. Almost 100 illustrations. Full cloth bound. Sent for \$1.00 C. O. D. plus a few cents postage. Write for MANUAL OF SHIP MODEL MAKING.

POPULAR SCIENCE MONTHLY, Dept. 19  
353 Fourth Ave., New York, N. Y.

**WORLD'S KEENEST KNIFE FOR HOBBY, ARTS AND CRAFTS**

Keen as a surgeon's scalpel. Cuts cleaner, faster and "ALWAYS SHARP" interchangeable blades, instantly removable by a slight twist of the chromium plated steel chuck which holds blade in vice grip. New! The ideal gift indispensable for the Model maker.

Aluminum handle and the professional.

12 sizes of blades to choose from, only 10c each. Order blades by number. No. 1 handle for blades #10 to 17. No. 2 handle for blades #18 to 23.

Add 3c for postage and packing. Send 10c for Model Ship and Fitting or 5c for Airplane and Engine Catalogue.

DEALERS Write on letterhead for profitable information about this fast selling item.

VISIT THE MOST COMPLETE HOBBY SHOP IN THE EAST  
**POLK'S MODEL CRAFT HOBBIES, INC.**  
420 N. SEVENTH AVENUE NEW YORK, N. Y.

**XACTO** Detachable Blade **KNIFE** HANDLE AND BLADE 50c



### EARN BIG MONEY MAKING ELECTRIC RAZORS

We furnish all parts and instruction sheets. Easy to assemble. No tools needed. \$1.65 in Lots of 2 ea. Sample \$1.95 ea. Order yours today—C.O.D. if you like  
**Simmons Manufacturing Company**  
Dept. PS-1, 126 W. North Ave., Chicago, Ill.

When Writing Advertisers  
Please Mention POPULAR SCIENCE

## NEW! NEON SIGNS FOR TRUCKS, BUSES, TAXICABS and other motor vehicles

—made possible by amazing new 6 volt transformer, and novel method of tube installation that protects tubing against breakage. Now used by some of the largest firms in U. S. Old Established factory wants financially responsible business executives—to handle distribution in exclusive territories. No previous sign experience necessary as we supply complete product. Signs fill long felt need. Enable any advertiser to have brilliant, colorful Neon advertising message on trucks, buses, taxicabs, etc. Also sign with word "STOP" in Neon, for use on all motor vehicles. New low prices should create large volume in any territory. Reasonable capital handles exclusive franchise contract. Get in on this new unexploited, highly profitable industry. Write or wire for free literature. Give references.

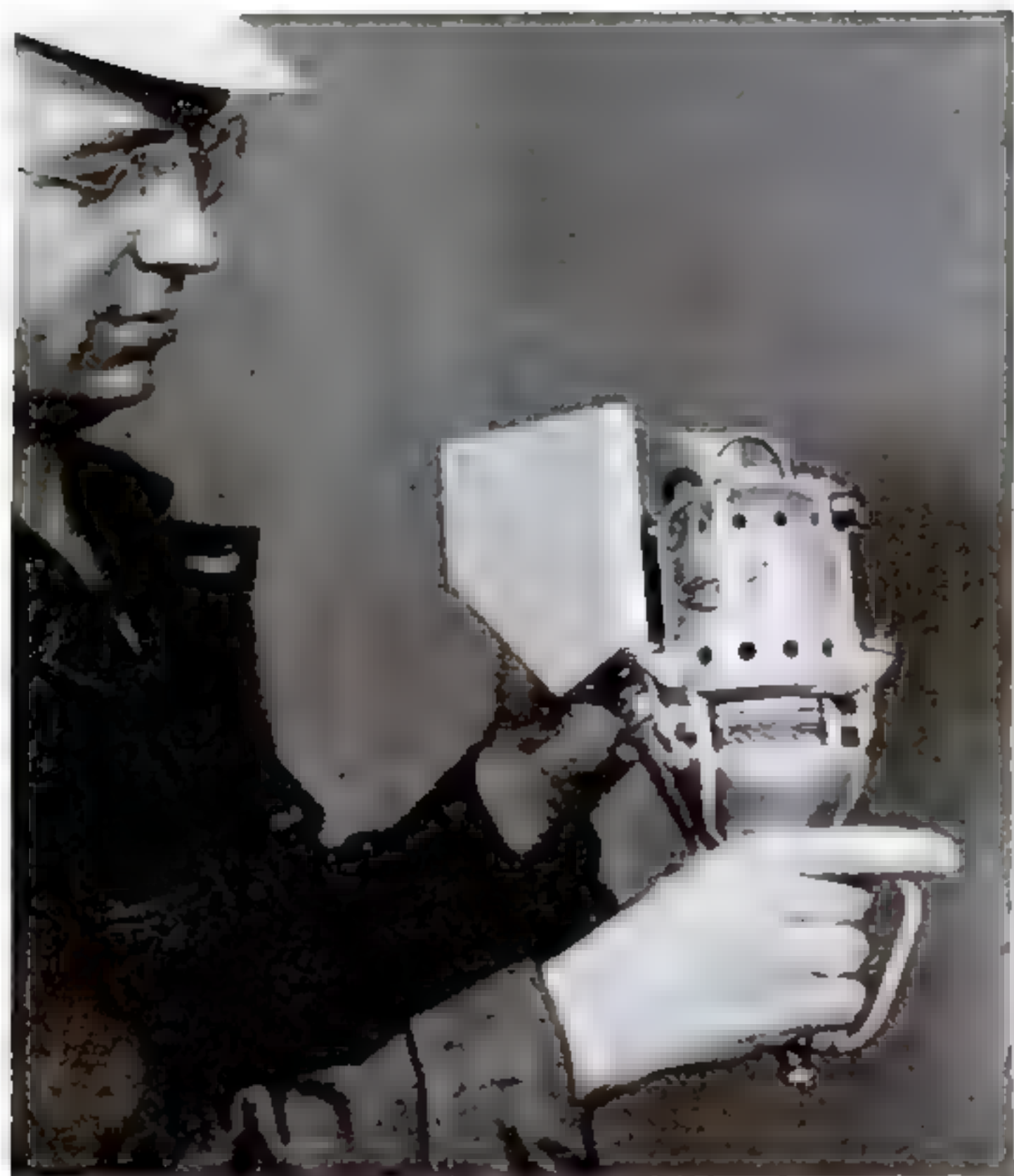
**E. E. SOUTHERN IRON COMPANY, (Established 1865)**  
1852-A-53 Kienlen Ave. St. Louis, Mo.



**Responsible  
DISTRIBUTORS  
WANTED**



# New Ideas for Home Owners



## Electric Paint-Spray Gun Needs No Air Supply

**C**OMPRESSED air is not used in a new paint-spraying gun that will cover 1,500 square feet of surface in one hour—five times as fast as brush work. Driven by a tenth-horsepower electric motor, the portable unit forces out paint in a fan-shape stream by means of centrifugal force. The paint stream is adjustable from less than one inch to eighteen inches in width. The electric spray gun weighs less than six pounds and can be plugged into any 110-volt outlet, since it will operate on either alternating or direct current.

## Sawhorses Easily Made With New Metal Clamps

**S**AWHORSES are constructed quickly and easily with metal joints now available. Two-by-fours of a desired length slip into pockets in the joints as legs, while the ridge is clamped in toothed jaws.



## Ingenious Striping Tool



**F**INE lines can be painted easily with an ingenious striping tool that fits over the ends of collapsible tubes of enamel. The tool has an adjustable guide arm and a set screw to control the paint flow.

## Auxiliary Outlet Sticks to Any Surface



**T**WO suction cups hold a new double electric outlet in place on a baseboard or wall. Another cup serves to take up the cord's slack and keep it clear of the outlet. The device can be applied without the use of tools, screws, nails, or clips, and is especially useful where it is not possible to install a standard outlet that lies flush with a wall surface. It can be attached to glass, tile, and metal, as well as to painted wood surfaces that are reasonably flat and are nonporous as well.



# No Wonder DIESEL PAYS SO BIG!

Diesel Engines produce "LOW COST" power—the newer ones are unbelievably light in weight. High Speed trains, passenger busses; huge trucks and now airplanes have adopted **DIESEL POWER**. Think what that will mean in the way of opportunities for **DIESEL TRAINED MEN**.

## Learn Diesel at Home

Get into this profitable field **NOW**—prepare for an ever increasing demand—know the answer to any Diesel problem. We train you at home in **SPARE TIME**. No need to waste a minute or interfere with work or pleasure. Prepare for advancement the Diesel way. Get in line for a Big Pay Job. Write for **FREE** bulletin—there is no cost or obligation.

**AMERICAN SCHOOL**  
Dept. D 146 Drexel at 58th Chicago

## ELECTRICAL ENGINEERING

ONE YEAR condensed course prepares for technical work in the electrical field. Thorough training in principles, with practical applications in laboratory and shop. High placement record. Modern buildings, dormitory, dining hall. Campus. 46th year begins Sept. 28. Catalog on request.

**BLISS** ELECTRICAL SCHOOL  
101 Takoma Ave.  
Washington, D. C.

## MECHANICS-WELDERS -COLLISION MEN

Good pay jobs for trained men in Auto and Diesel Mechanics, Electric Arc and Acetylene Welding. Complete courses. Practical training. Short courses in body and fender bumping, spray painting, metal finishing. Fine equipment. Special low rates. Pay-after-graduation-plan. Write today.

Write for  
**FREE  
FOLDER**

Michigan Trade School  
3761 Woodward Ave. Detroit, Mich.

## Succeed in Landscaping

SEND FOR FREE BOOK ON LANDSCAPE TRAINING

Full details about this profitable career for men or women. Study at home in leisure time. Successful graduates receive large fees. Students earn \$5, \$10, \$15 a week while learning. Field uncrowded; initiative rewarded. Write today, giving age and occupation.

**AMERICAN LANDSCAPE SCHOOL**  
6036 Grand Ave. Des Moines, Ia.

## BE A PASSENGER TRAFFIC INSPECTOR

Help Yourself to Success. . . .

Give a few weeks' spare time this winter to our home-study course on **Railway and Bus Traffic Inspection**. Splendid opportunities for trained graduates whom we place at up to \$135 per month, plus expenses, to start, or refund tuition. Free Booklet.

**STANDARD BUSINESS TRAINING INSTITUTE**  
Div. 301 Buffalo, N. Y.

## CARTOON YOUR WAY TO SUCCESS!

DON'T COPY - LEARN TO ORIGINATE!

RAYE BURNS will teach you **HOW** to **CREATE** ORIGINAL CARTOONS at home that you can **SELL!** Course has 26 lessons and 600 illustrations. **\$2.85**

Send name and address for free details. Only.....

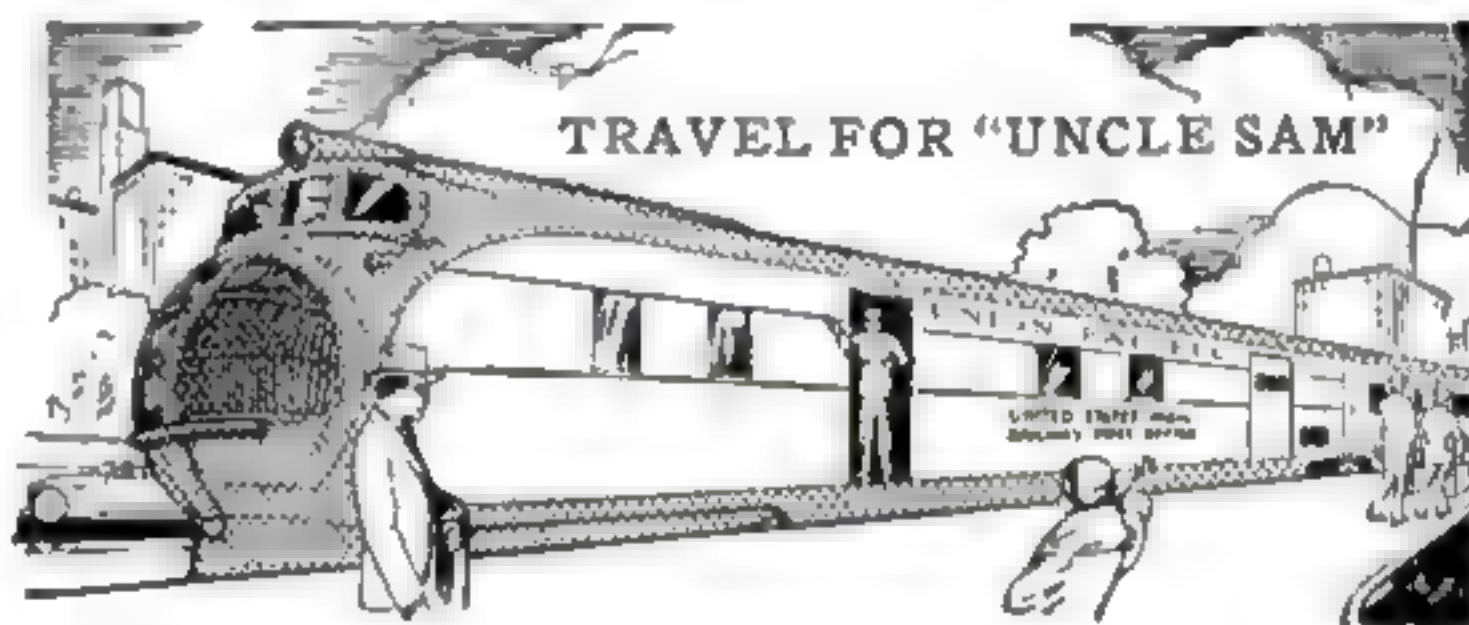
RAYE BURNS SCHOOL, Dept. S-2, Box 2194, CLEVELAND, O.



**Start \$1260 to \$2100 a Year**  
**Many 1939 Appointments**  
**Expected**  
**MEN, WOMEN**

### Railway Postal Clerks

Railway Postal Clerks get \$1,900 the first year regular, being paid on the first and fifteenth of each month. (\$79.17 each pay day.) Their pay is automatically increased yearly to \$2,450. Advance may be had to Chief Clerk at \$2,700 a year. (\$112.50 each pay day.)



### 3 Days On—3 Days Off—Full Pay

Railway Postal Clerks on long runs usually work 3 days and have 3 days off duty or in the same proportion. During this off duty their pay continues just as though they were working. They travel on a pass when on business. When they grow old, they are retired with a pension.

### City Mail Carriers, Post Office Clerks

Clerks and Carriers now get \$1,700 the first year on regular and automatically increase \$100 a year to \$2,100 and \$2,300.

## GOVERNMENT CLERK



### File Clerk—Clerk

Open to Men—Women 18 to 50. Entrance salary \$1250—\$1440 Year. Appointments as File Clerks and Clerks in the Departments at Washington, D. C., are made from this examination.

### Many Other Positions

Many other positions are obtainable. Those wishing these positions should qualify at once.

### Get Free List of Positions

Fill out the following coupon. Tear it off and mail it today—now, at once.

This investment may result in your getting a big-paid government job.

FRANKLIN INSTITUTE, Dept. E-257, Rochester, N. Y.

Rush to me, entirely free of charge (1) a full description of U. S. Government Jobs; (2) Free copy of illustrated 32-page book, "U. S. Government Positions and How to Get Them"; (3) List of U. S. Government Jobs; (4) Tell me what to do to qualify for a U. S. Government Job.

Name.....

Address.....

Use This Coupon Before You Mislaid It. Write or Print Plainly.





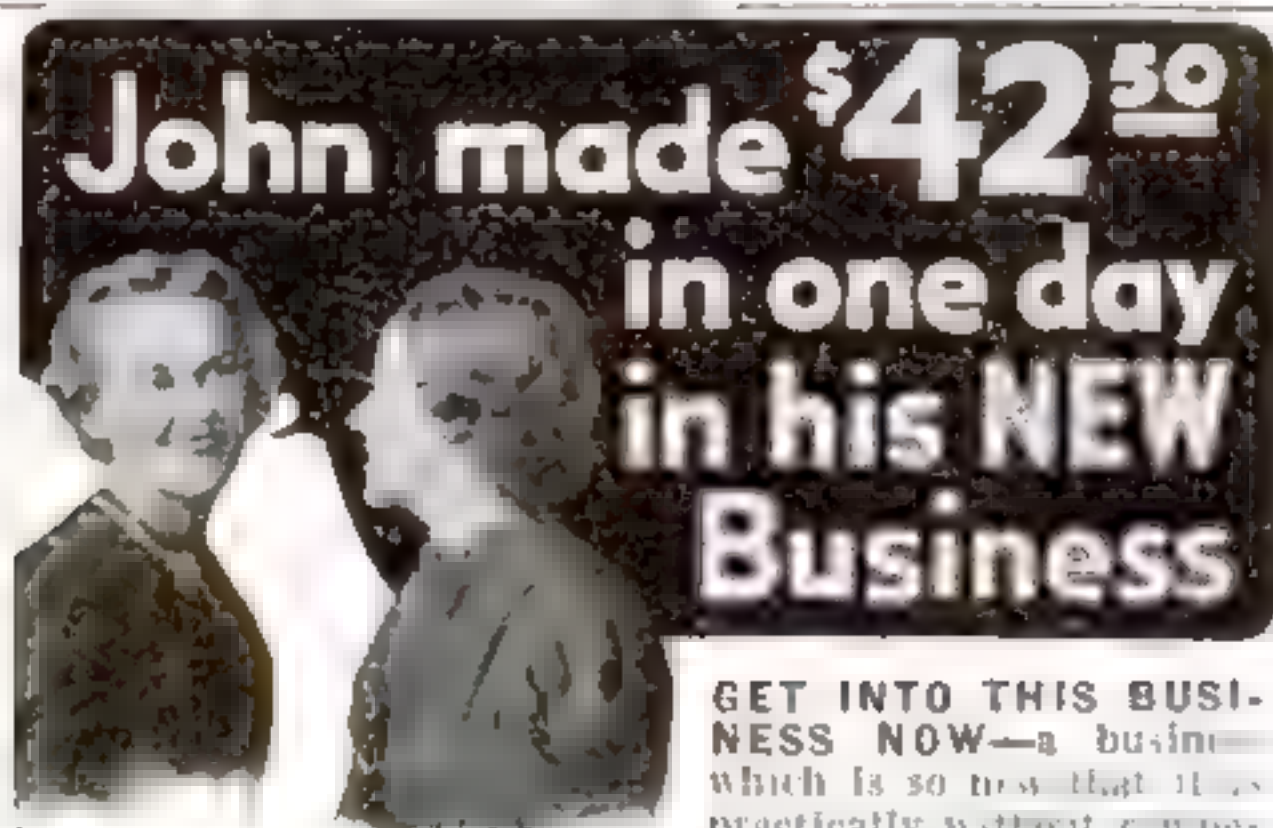
...builds, repairs, patches . . . with lifetime strength

● Want *one* good glue—to do many good jobs? Call for CASCO. Proved on many of industry's toughest gluing problems, CASCO mends most everything from attic to cellar. Glues wood, cloth, leather, etc. Its weatherproof bond resists heat and moisture.

**NO MESS.** Just mix CASCO with water... no heating, no waste. **LOW COST.** Get *all* glue for your money...no liquid preservatives. 10c to 65c at hardware dealers.

**FREE—NEW KIND OF HANDBOOK** "Home Workshop Handbook" includes list of free and low-cost booklets on Tools, Plans, Finishes, etc. **CASEIN COMPANY OF AMERICA, DEPT. PS-139** 350 Madison Avenue, New York, N. Y.

**CASCO** POWDERED CASEIN GLUE



GET INTO THIS BUSINESS NOW—a business which is so new that it is practically without competition. This alone should

enable you to make really BIG MONEY. Hotels, homes, clubs, office buildings offer tremendous possibilities. Our new **DETERGER washes** upholstered furniture, electrically, with a new soapless soap whipped into dry suds. We have helped hundreds of men get into business for themselves with our automatic equipment. The U. S. Government and many of the world's largest hotels use our machines.

#### Make Money the FIRST DAY

The Deterger is ready to run when you receive it, so you ought to be taking in big profits the first day. C. M. Cheadle made \$121.00 first week. Barrett says, "Made \$28.00 in 8 hours." We want an honest, ambitious man in every locality. If you are that man we will help you start for yourself in a business with tremendous possibilities. Only a limited amount of money is needed for a down payment—the balance you send on easy terms. You don't need to rent a shop or hire a building, for the work is done right in your customer's home.

#### Write Today for FREE BOOK

Send for "Your Own Business." Let us show you how easy it is to get started in a year around business. Be your own boss and stop worrying about just a job. Write today—NOW. No obligation.

**VON SCHRADER MFG. CO.**  
611 Pl. Racine, Wisconsin

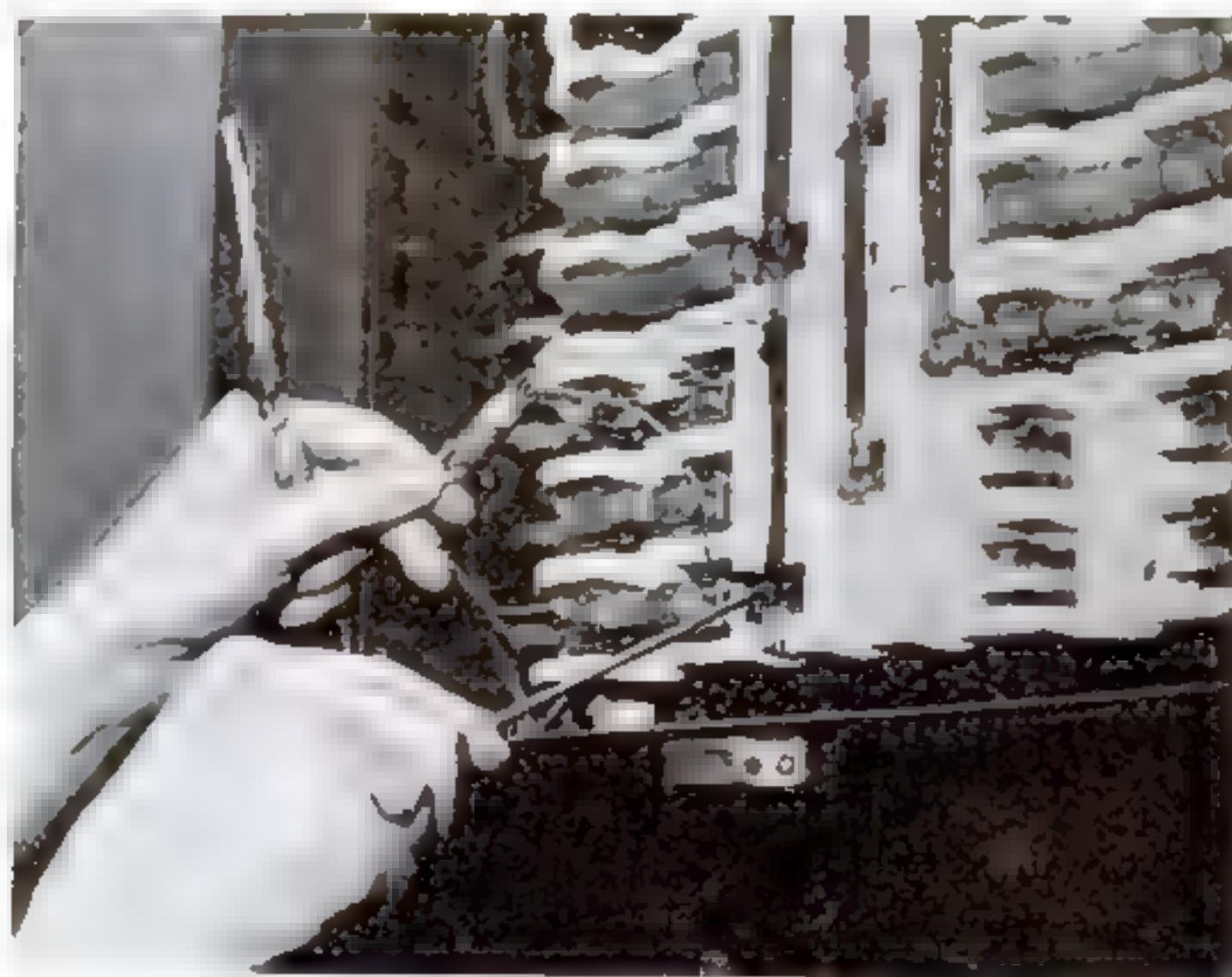


## Clip Holds Loose Windows So They Can't Rattle

A SIMPLE device now on the market is designed to end the annoyance of loose-fitting windows that rattle in the wind. Consisting of a strip of springy steel with toothed edges, the silencer is pressed flat and slipped into the crack between the sash and the frame. The edges bite into the wood to prevent slipping as the strip's spring action holds the window tight.

## Neon-Bulb Indicator Tells When Fuse Is Blown

LOCATING a blown fuse among the many good ones in a large fuse box is no job at all when each fuse is fitted with a handy new indicator. Permanently connected in parallel across the terminals of a fuse, the device has a tiny neon bulb that lights up when the fuse blows.



Installing an indicator unit across the terminals of a fuse. A neon bulb lights when the fuse blows



# Air Become An Conditioning Engineer

Big fast-growing field for men trained in design, estimating, insulating, installing and servicing. Offers real opportunities in Air Conditioning new buildings and remodeling worth-while old buildings. Write today for method of how you can prepare for this thriving industry. No obligation.

American School, Dept. AC-146, Draxel at 58th, Chicago

Operator  
No. 38



## FOLLOW THIS MAN

Secret Service Operator No. 38 is on the job! Running down dangerous Counterfeit Gang. Tell-tale finger prints in murdered girl's room.

**Free** The Confidential Report Operator No. 38 made to his chief. Write for it.

Earn a Regular Monthly Salary

YOU can become a Finger Print Expert at home, in your spare time, at small cost. Write for confidential full report and details. Literature will be sent only to persons stating their age.

INSTITUTE OF APPLIED SCIENCE

Dept. 1361 1920 Sunnyside Ave. Chicago, Ill.

## ENGINEERING DEGREE IN TWO YEARS

B.S. DEGREE courses in engineering: Electrical, Civil, Chem., Mechanical, Radio and Television, or Aeronautical, 1 yr. Mech. Drafting. Intense, practical, thorough program. Prep. courses without extra charge. Earn while you learn in this industrial center. Low tuition. Enter March, June, Sept., Dec. Write for Catalog.

243 E. Washington Blvd., Fort Wayne, Ind.

## INDIANA TECHNICAL COLLEGE

## EARN THE DEGREE

Doctor of Philosophy (Ph.D.), Philosophy, Science, General Courses—Arts, Law, Business, etc. "CHARTERED BY STATE OF MONTANA." Send for 32-page FREE Bulletin at once. No obligation.

Temple Bar College, Dept. B, 213 East Main Street

Missoula, Montana, U. S. A.

## Want a Career in photography?

Profit by the growing demand for photographs! Wonderful money-making opportunities in Commercial, News, Portrait, Advertising, Natural Color, and Motion Picture Photography. Train at home or in our modern, completely equipped studios. 29th year. Send for free booklet.

NEW YORK INSTITUTE OF PHOTOGRAPHY  
10 West 33 St. (Dept. 5) New York City

## WANTED—MEN

to cast Christmas Goods, 5 and 10c Novelties, Toy Autos, Ashtrays, etc. Can be done in any spare room, basement or garage and no experience necessary. A rare opportunity to devote spare or full time to profitable work. WRITE DEPT. E.

METAL CAST PRODUCTS CO.

1696 Boston Road New York City

## DON'T BUY—SAVE \$ \$ \$

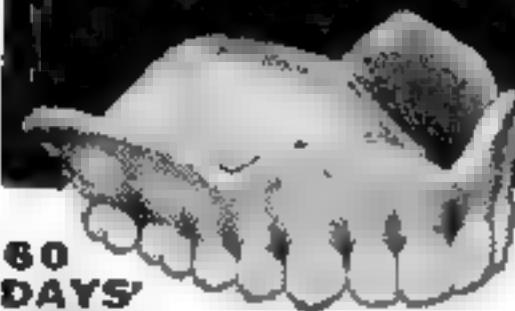
ON RADIO SETS—PARTS, TUBES, PHONOGRAPH RECORDS—UNTIL YOU HAVE SENT FOR OUR NEW GIANT MONEY-SAVING CATALOGUE.

UNITED RADIO COMPANY, DEPT. Z, NEWARK, N. J.

## Enjoy BEAUTIFUL Natural-Looking FALSE TEETH

LOWEST PRICES

SEND NO  
MONEY



60 DAYS TRIAL satisfaction. Monthly payments possible. FREE month-forms, directions, catalog. WRITE TODAY! C. T. Johnson, Pres. UNITED STATES DENTAL COMPANY  
Dept. 142 1555 Milwaukee Ave. Chicago, Ill.

## DO YOU LIKE RADIO DOES THE FUTURE OF TELEVISION

INTEREST YOU?

Send for  
your  
free copy



You men anxious to make good in radio and related industries want the true facts.—you want to know about employment opportunities and requirements. National Schools,—a million-dollar trade school,—will supply you with a sincerely honest statement of facts on what you should do to get into the profitable radio industry. No exaggerations,—no misstatements. Mail coupon today. [Send for your free copy. Real facts on radio employment requirements. [You need real experience. National offers complete training with modern equipment.

## NATIONAL SCHOOLS

Los Angeles

Request for FREE BOOK of DETAILS

NATIONAL SCHOOLS,

Dept. 1-PSN 4000 S. Figueroa St., Los Angeles, Calif.

NAME

Age

ADDRESS

CITY

STATE



## I'll Train You in DRAFTING until You Get a GOOD PAY JOB

GET MY  
PROVEN  
PAY  
RAISING  
PLAN

Get practical training. Take up Drafting—because it gives you bigger, better chance to get into your favorite field—Electricity, Aviation, Diesel, Air Conditioning, Automotive, Building, Machinery, Transportation, etc. Remember, everything built has its birth on the Draftsman's Table.

### Draftsmen Draw Good Pay

I have trained thousands of men aged 16 to past 50 in their spare time at home, to qualify for Bigger Jobs at Better Pay. Let me train you in a short time by same easy, low cost practical method. No experience needed. High School education not necessary.

### All Working Tools Furnished

You get complete Professional Draftsman's Tools and Drawing Table—sent without extra charge at once. Mail coupon for Free Book about my PROVEN PAY RAISING PLAN. Write TODAY!

ENGINEER DOBE, Div. 3391, Libertyville, Illinois

ENGINEER DOBE, Div. 3391, Libertyville, Ill.

Send me your Free Book "SUCCESSFUL DRAFTSMANSHIP." Explain how you assist your graduates to good positions as Draftsmen.

NAME

AGE

ADDRESS

TOWN

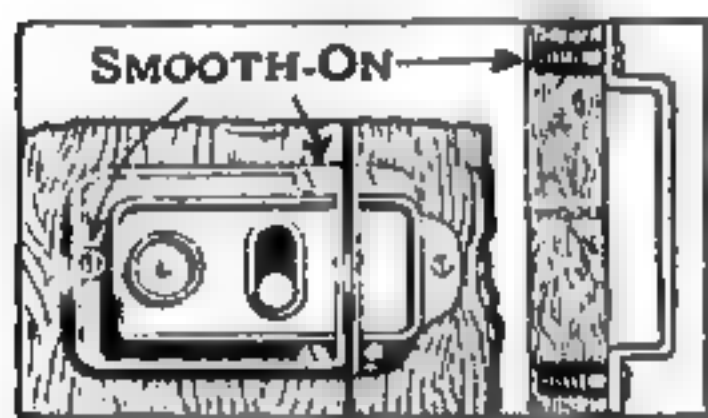
STATE



## FASTENING SHELVES to MASONRY WALLS

**C**UT holes into the masonry with a cold chisel, insert bolts *with heads in* to form studs, and tamp remaining open spaces full of Smooth-On No. 1. Let the Smooth-On harden, then slip the brackets, cleats or uprights over the studs and fasten with nuts or nuts and washers. A  $\frac{1}{4}$ -in. bolt set this way holds a man's weight without loosening. Use this method to anchor cellar shelves, partitions, wall cabinets, etc. Makes a strong permanently tight connection that meets every need.

**D**O your own simple home, auto and motor-boat repairing and be independent of outside repair men. You will avoid delays, save much money, and have the satisfaction of knowing that the work is well done.



Tightening loose locks

The booklet contains clear diagrams and directions for correct procedure for hundreds of common jobs, and enables any home worker to get dependable results, *easily*, on any of the following:

Stopping leaks in pipes, heaters, boilers, tanks, radiators, air ducts, smoke pipes, pails, etc., at connections, seams, cracks, rivets or holes.

Tightening or anchoring loose hinges, locks, handles, screws, bolts, nuts, bases, stems, tops, casters, etc.

Making water-proof joints at skylights, roof cracks and flashing.

Smooth-On Iron cement with which this work is done is applied without heat, without special tools, and so easily and inexpensively that half a dollar to half a hundred dollars is saved in each instance.

Smooth-On has been widely used in industrial work for over 35 years and its use is standard practice by power plant engineers and repair men.

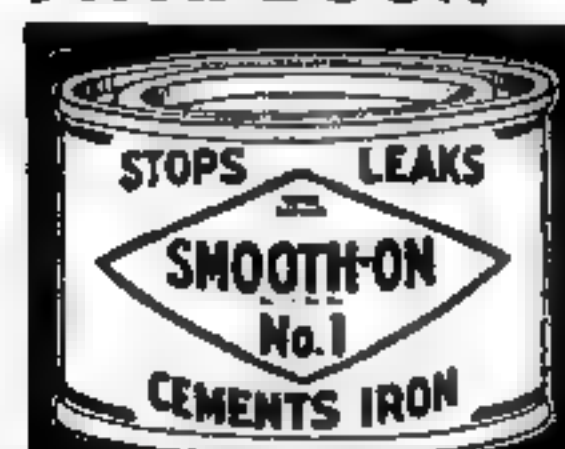
Get the booklet by mailing the coupon and buy Smooth-On No. 1 in 7 oz., 1 lb. or 5 lb. can from your hardware store or if necessary from us.

SMOOTH-ON MFG. CO. Dept. 58  
574 Communisaw Ave., Jersey City, N. J.  
Please send Smooth-On Home Repair Book.

Name \_\_\_\_\_  
Address \_\_\_\_\_  
1-30 \_\_\_\_\_



Write for  
**FREE BOOK**



*Do it with* **SMOOTH-ON**

## Questions FROM HOME OWNERS

**Q.**—WHENEVER steam starts to come up in our heating system, we notice a definite thumping sound which seems to be in the walls. Can you tell us what causes this annoying noise, and how it can be fixed?—H.L.Y., Duluth, Minn.

**A.**—THE thumping sound may be caused by steam forcing its way up through the pipes against plugs of water from condensation flowing downward toward the furnace. Readjusting the slope of the pipes should end the trouble. However, the noise could also be caused by movement of the pipes as they pass between upper and lower floors through holes that are too small to allow them to expand and contract freely. If you find this to be the case, you should enlarge the holes enough to eliminate friction.

### Varnish in Paint Brushes

**F.G., STEUBENVILLE, OHIO.** If amyl acetate, available in most drug stores, is poured over a hardened paint brush, the varnish in it will dissolve almost immediately. The acetate can then be easily removed from the brush with the use of alcohol or oil of turpentine.

### Nonskid Cement Walk

**Q.**—IS THERE anything that will roughen a smooth-finish cement sidewalk to make it less slippery in wet weather?—A.W., Racine, Wis.

**A.**—FIRST wet the surface, then apply a ten-percent solution of muriatic acid and let it stand until the acid etches into the concrete surface and thereby roughens it. Then rinse the sidewalk thoroughly with water. Another method is to chip the surface lightly with an air hammer. This should be done by an expert.

### Translucent Window Covering

**Q.**—FOR the sake of privacy, I want to paint the glass in one of our windows that faces directly onto the street. What procedure should I follow to produce this effect?—M.H., Lansford, Pa.

**A.**—A MUCH easier and more satisfactory method than painting would be to obtain at a hardware store a sheet of thin, translucent paper that can be stuck onto the glass. These come in various designs. They will admit some light, but no one will be able to look in your window.





# EASIEST TO MASTER!

## THIS NEW P-A

● Such beautiful tone, and so easy to play! Just touch a key and blow normally; you can't miss. Nothing to compare with these new P-A Saxes, Clarinets, Trumpets, and other P-A instruments. Fully guaranteed; your success assured. See your music dealer or write direct for beautiful free book. No obligation. Easy terms. Greatest fun, easiest with P-A. Write today sure. 1284

**PAN-AMERICAN**  
104P-A Bldg., Elkhart, Indiana

**\$ AGENTS 300% Profit GOLD LETTERS**  
For Store Fronts and Office Windows. Anyone can put them on. Free samples. Liberal Offer to general agents.  
**METALLIC COMPANY, 437-A North Clark St., Chicago.**

**SAVE THAT OLD TIRE**  
Amazing new plastinoid "putty"—**SO-LO** ONLY  
—fills cracks, holes in old tires, shoes, boots—anything of rubber, leather or cloth. Spreads on like butter. Dries tough overnight. Waterproof, flexible, non-skid. Won't come off—guaranteed! 25c package (25 repairs) shows many uses. Get **SO-LO** at any 10c or hardware store.

**New York Electrical School** Established 1902  
Ask for free booklet  
40 West 17th St., N. Y. C.

**SAVE YOUR TOOLS FROM DAMAGING RUST With QUIK-TRIK RUST REMOVER**  
For less than the price of one of your least expensive tools, save all of them from rust. Quik-Trik removes rust from anything. Your money back if you don't agree that it's the best you've ever used. Tell your friends. Send 50 cents for big jar; postage prepaid; U. S. only. Agents.  
**BRAVO PRODUCTS COMPANY**  
63 W. Milwaukee Avenue Detroit, Michigan

**Class Pins 30¢ up FREE CATALOG**  
Artistic pins, rings and emblems for classes and clubs. Attractive prices. Finest quality, gold plated, silver, etc. Over 300 designs  
Write Dept. 8, METAL ARTS CO., Inc., Rochester, N. Y.

**Sensational MONEY MAKER**  
There is a flood of quick profits waiting for those first to introduce this amazing new liquid that joins all kinds of materials as if one piece. Men and women make big incomes in direct sales. Also, counter carded so you can sell in quantities to dealers and let them sell for you. **WAGON JOBBERS, CARD MEN, SPECIALTY MEN**—here's a real opportunity to add a real product to your line. **THRIFTEE-FIX** will mend almost everything imaginable without heat, soldering irons or acids. Agents cleaning up. Big repeat business—enormous profits. Write **TODAY** for sample proof and particulars.  
**Over 1000 Uses**  
**INDIANA LABORATORIES**  
Dept. TI-49, Elkhart, Ind.



# DRAFTING

## BOOKS SENT FREE!

ON APPROVAL  
5 VOLUMES BRAND NEW EDITION

Only 15 minutes a day with these **WONDER BOOKS** can prepare you for a good drafting job in less than a year. Mechanical and architectural drafting from simple straight lines to important complex plans. *A step at a time!* Built especially for beginners, for men with only grammar schooling. Drafting room practice, **PLUS ENGINEERING**, made easy and clear. Includes complete information on blueprint reading for building and machine trades.

### Big Field Big Demand Big Pay

Competent draftsmen are urgently needed right now in all building and manufacturing lines at \$30.00 to \$75.00 a week. That's just the beginning—**FOR DRAFTSMEN HAVE THE BEST CHANCES FOR ADVANCEMENT**. Pleasant, fascinating work, easy to learn and do. Learn quickly with these books—send coupon for a set and see for yourself.

*A year's consulting membership in the American Technical Society now given to all readers of this famous encyclopedia of drafting. Many say that it is worth more than the cost of the books.*

Complete set of drawing instruments if you send for these drafting books **NOW**. These instruments are made of the finest of German silver, are absolutely accurate and are packed in velvet lined leatherette pocket case. Real \$10 value, but included with these books.

**AMERICAN TECHNICAL SOCIETY**  
Dept. D120, Drexel at 58th St., Chicago, Ill.

American Technical Society, Dept. D120, Drexel at 58th St., Chicago, Ill.  
Send for 10 days' trial New 5 volume set of drafting. I will pay the few cents delivery charges. If I wish, I may return books in 10 days and owe you nothing but if I decide to keep them, I will send \$2.00 after 10 days, then only \$3.00 a month until \$24.50, the advertising price, is paid. Send latest edition and include drawing instruments and Membership Certificate.

Name .....  
Address .....  
Attach letter stating age, occupation, employer's name and address and that of at least one business man as a reference.

## Learn this Profitable Profession



## in 90 Days at Home

Hundreds of men and women of all ages 18-50 make \$10.00 to \$20.00 in a single day giving scientific Swedish Massage and Hydro-Therapy treatments. There is a big demand from Hospitals, Sanitariums, Clubs, Doctors and private patients as well as opportunities for establishing your own office.

Learn this interesting money-making profession in your own home by mail, through our home study course. Name instructors as in our **NATIONALLY KNOWN** resident school. A diploma is awarded upon completion of the course. Course can be completed in 3 to 4 months. High School training is not necessary. Many earn big money while learning.



### Anatomy Charts & Booklet FREE

Enroll now and we will include uniform coat, medical dictionary, patented reducing roller and Hydro-Therapy supplies without extra cost. The reducing course alone may be worth many times the modest tuition fee.

Send coupon now for Anatomy Charts and booklet containing photographs and letters from successful graduates. These will all be sent postpaid—**FREE**.

**THE College of Swedish Massage (Successor to National College of Massage)**  
Dept. 170—1601 Warren Boulevard, Chicago.  
You may send me **FREE** and postpaid, Anatomy Charts, booklet containing photographs and letters from graduates, and complete details of your offer.

Name .....  
Address .....  
City ..... State .....

Please mention **POPULAR SCIENCE** when writing to advertisers.



# THE WORLD'S FINEST RADIO CATALOG **FREE!**

188 Pages of smashing values! 60 great new 1939 Lafayette radios plus parts, tubes, test equipment, television, tools—everything in radio—more than 50,000 items, nationally advertised, offered to you here at tremendous savings. Send for this remarkable **FREE** catalog immediately. Simply paste coupon on penny postcard.

## BUILD YOUR OWN RADIO!

Build any of the circuits described in this magazine. We supply parts for all of them. See our free catalog.

**WHOLESALE RADIO SERVICE CO., INC.**  
NEW YORK, N.Y. CHICAGO, ILL. ATLANTA, GA.  
100 SIXTH AVENUE 901 W. JACKSON BLVD. 245 PEACHTREE STREET  
BOSTON, MASS. • BRONX, N.Y. • NEWARK, N.J. • JAMAICA, L.I.

**WHOLESALE RADIO SERVICE CO., INC.**  
Dept. 9A9—100 Sixth Ave., New York, N.Y.  
Rush **FREE** 1939 Catalog No. 73.

Name.....

Address.....

City..... State.....

PASTE COUPON ON PENNY POST CARD



## FREE 25,000 BARGAINS in BOOKS

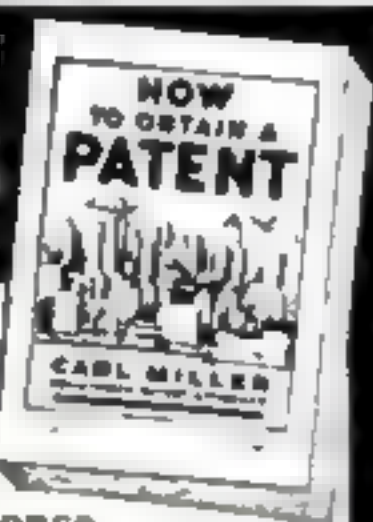
Our 44th Annual 320-Page Bargain Catalog of new Books of all Publishers lists 25,000 titles—Fiction, Juvenile, History, Scientific, etc. Illustrated, Indexed. Used by Schools, colleges, libraries, and thousands of individuals. Write today for this new 1939 catalog, "Bargains in Books."  
**THE BOOK SUPPLY COMPANY, Dept. 148**  
564-566 West Monroe Street - Chicago, Illinois

## INVENTORS PATENT YOUR IDEAS SEND FOR FREE BOOK

### HOW TO OBTAIN A PATENT

Written by a Former Member of the Examining Corps (1922-24) of the U.S. Patent Office. If you want to profit by your idea, you should take steps to apply for a U. S. Patent at once. Your first step is to get this Free Book. This interesting illustrated book contains valuable information you should have. It tells you fully how to obtain a patent on your idea in the quickest way. With this Free Book you will also receive a "Record of Invention" form on which you can easily record your idea. Personal and Confidential Service: Your case will be personally handled only by a Registered Patent Attorney who is also a Former Member of the Examining Corps of the U. S. Patent Office. All communications confidential.

MAIL COUPON TODAY for FREE PATENT BOOK and RECORD OF INVENTION Form.



**CARL MILLER**  
REGISTERED PATENT ATTORNEY  
FORMER MEMBER EXAMINING CORPS U. S. PATENT OFFICE

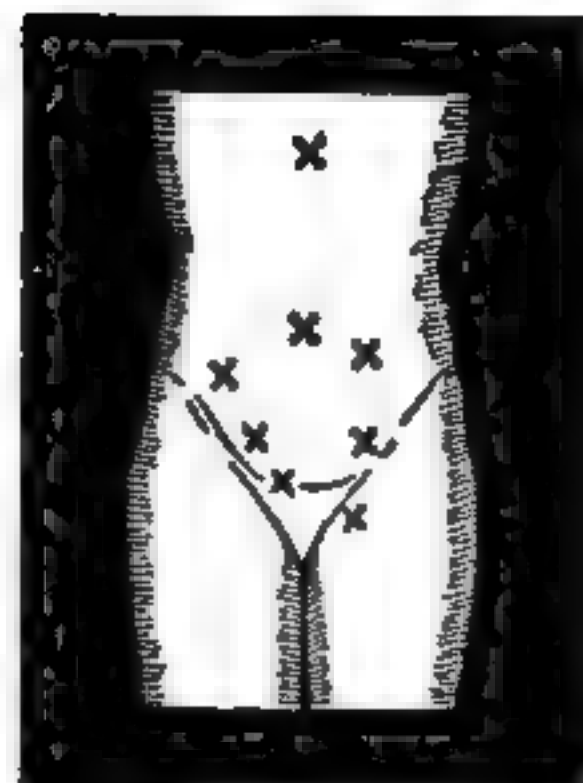
Woolworth Bldg., 35th Floor, Dept. 19C, New York City  
MILLER BUILDING, Dept. 19C, Washington, D. C.  
Please send me your Free Book, "How to Obtain a Patent," and your "Record of Invention" form.

NAME.....

ADDRESS.....

## Is Your Rupture HERE?

Why delay proper palliative treatment? If you suffer from rupture—and your doctor advises the use of a proper-fitting support—send for the facts about our perfected truss invention—the Brooks Appliance for reducible rupture—with the **AUTOMATIC AIR-CUSHION SUPPORT**. Thousands bought by doctors for themselves and patients.



**Sent on Trial**—Made-to-measure, individual fitting for man, woman or child. Low-priced, sanitary, durable. No obnoxious springs or hard pads; no metal girdle to rust. Safe and comfortable. Helps Nature get results. Not sold through stores—beware of imitations. Write today for full information sent free in plain sealed envelope.

**BROOKS APPLIANCE CO.** 459-A State St. Marshall, Mich.

## INVENTORS PROTECT & SELL

★ Your unpatented invention can be sold with positive safeguards under patent laws. New, low-cost procedure. Complete details, free.  
★ **AMERICAN PATENTS CORPORATION**  
★ Dept. 3-E Washington, D. C.

## PLASTEX

The Plastex Industry needs manufacturers on small scale and for big production of Lamp and Clock Stands, Art Goods & Novelties in Plastex and Marble imitation. Experience unnecessary. 1/2¢ material makes regular 10¢ store sellers. Rubber moulds furnished for speed production. Small investment brings big results. Ambitious men have chance for real prosperity. Our free booklet will interest and benefit you.

**PLASTEX INDUSTRIES, Dept. 2**  
1085 Washington Avenue New York, N.Y.



## Learn Public Speaking

At home—in spare time. Many overcome "stage-fright," gain self-confidence, and increase their earning power, through ability to sway others by effective speech. Write for free booklet, *How to Work Wonders With Words* and requirements.  
**NORTH AMERICAN INSTITUTE, Dept. 1361**  
3601 Michigan Avenue Chicago, Illinois



## Best Poultry Paper 6 BIG ISSUES 10¢

Helps increase Poultry Profits. Send coin or stamps. 50 cents for 3 years or 10 cents for 6 months trial. Agents wanted. **American Poultry Journal**  
554 So. Clark Street Chicago, Illinois



## CARTOONING

**FREE TRIAL LESSON in CARTOONING.** Cash in on your sense of humor with professional cartoons—AT HOME—BY MAIL. Send stamp for **FREE TRIAL LESSON** and further details. **MOON GAG-CARTOON SCHOOL, Box 106—Dept. B, Fall Creek, Wis.**

## MONEY-MAKING OPPORTUNITY

for men of character. Over \$1,600 per month earned by California man. Over \$400 a week by Georgia man. \$1,000 in a month by Delaware man. Exclusive franchises available for an invention expected to replace a multi-million dollar industry. Install on free trial. Sell itself. Repeats. Exclusive proposition. Write **F. E. Armstrong, Dept. 1152-A, Mobile, Alabama.**

**CRIME DETECTION SECRET SERVICE AND FINGER PRINTS**

**SECRET SERVICE BOOK FREE**

For 30 Days Reading  
No Money Down—Actual Crime Cases—  
If You Act Quick! We will send you this stirring book on Crime Detection, Secret Service and Identification Work for 30 days free reading. Send no money. If you decide to keep it, then send me only \$1.00. If not, return it. **WRITE TODAY**. Literature will be sent only to persons stating their age.

**T. G. Cooke, Dept. 1361, 1920 Sunnyside Ave., Chicago, Ill.**



## New Amazing INVENTION! ELECTROPLATES by BRUSH EASY AS PAINTING!



**NO TANKS, Liquid Generators — Does Same Work As Big Outfits**  
Sensational news! Marvelous new discovery actually electroplates with electric brush as easy as painting. Deposits heavy layer of actual metal—gold, silver, nickel, cadmium, copper, etc.—by electrolysis. Does same beautiful, **PERMANENT** work as big costly tank outfits. Non-liquid. Anyone can use from dry cells, storage battery or household current. Complete outfit weighs only 3 lbs.—take it anywhere.  
**FREE SAMPLE!** Send today for amazing details and **FREE** Sample that proves all claims.  
**Agents Wanted: Write for Big Money Proposition**  
Sell Outfits—Do plating for others  
**WARNER ELECTRIC CO., Dept. E-2**  
360 North Michigan Avenue, Chicago, Illinois

Only  
**\$685**

## PATENTS—TRADE MARKS

All cases submitted given personal attention. Form "Evidence of Conception" with instructions for use and "Schedule of Government and Attorneys' Fees"—**FREE!**

**LANCASTER, ALLWINE & ROMMEL**  
(Patent Law Offices)

413 Bowen Bldg. Washington, D. C.

## Inventions Wanted Patented or Unpatented

We have been successfully selling inventions, patented and unpatented, since 1924. Write for proof, and tell us what you have for sale.

**Chartered Institute of American Inventors**  
Dept. 3, Barrister Building Washington, D.C.

## Inventions Promoted

Patented or Unpatented. In business over 30 years. Send drawing and description or model, or write for information. Complete facilities. References.

**ADAM FISHER COMPANY**

183-D Enright, St. Louis, Mo.

## PATENTS PERSONAL SERVICE

My Personal service assures strictest confidence on all your patent problems. Send me a model or drawing, or

sketch and description of your invention, and \$5.00. I will make a search and report promptly as to its patentability and send you a copy of my 72-page booklet. Or, if you prefer to read my booklet first, write today for **FREE** copy. Registered Patent Attorney.

**L. F. Randolph, 340-D Victor Bldg., Washington, D.C.**

## RADIO

**ENGINEERING**, broadcasting, aviation and police radio, servicing, marine and Morse telegraphy taught thoroughly. Nine months' engineering course equivalent to three years' college radio work. School established 1874. All expenses low. Catalog free.

**Dodge's Institute, Nye St., Valparaiso, Ind.**

## BUILD YOUR GRANDFATHER CLOCK

The Simple, Sensible Red-I-Kut way as thousands have. DIME brings PLANS and sixty picture "HOW" Book pricing many fine brass weight Westminster, tube chime, electric and battery movements showing nine beautiful colonial grandfather cases. **WHY WAIT LONGER?** Kuempel Chime Clock Co., Clock Headquarters, Bldg. A-4, Gettysburg, Iowa

## BARGAINS!!!

## Used Home-Study Books BOUGHT-SOLD-RENTED

**FREE ILLUSTRATED CATALOG** tells all about this amazing service. Educational books on all subjects. We buy for cash—we offer sensational bargains. 100% satisfaction guaranteed on every transaction. Send postcard today for full details and big **FREE** catalog. No obligation.

**NELSON-HALL CO.**

781 Manhattan Bldg., Chicago.

## Inventors—

# FREE BOOKS



Now Tell You How To **PROTECT**  
And To **CAPITALIZE** On Your  
Invention • *Save Time, Money*

● At last here are the patent facts you want. Competent advice on patent procedure is essential to good results. Our 63 years' experience enables us to clearly explain everything you need to know about protecting and commercializing your idea. You will find the answers in these free booklets that are yours for the asking. If you want prompt advice from reputable patent attorneys, tear out and mail the coupon below at once.

**C.A. SNOW & CO.**

Registered Patent Attorneys Since 1875

FREE FACTS  
FOR YOU

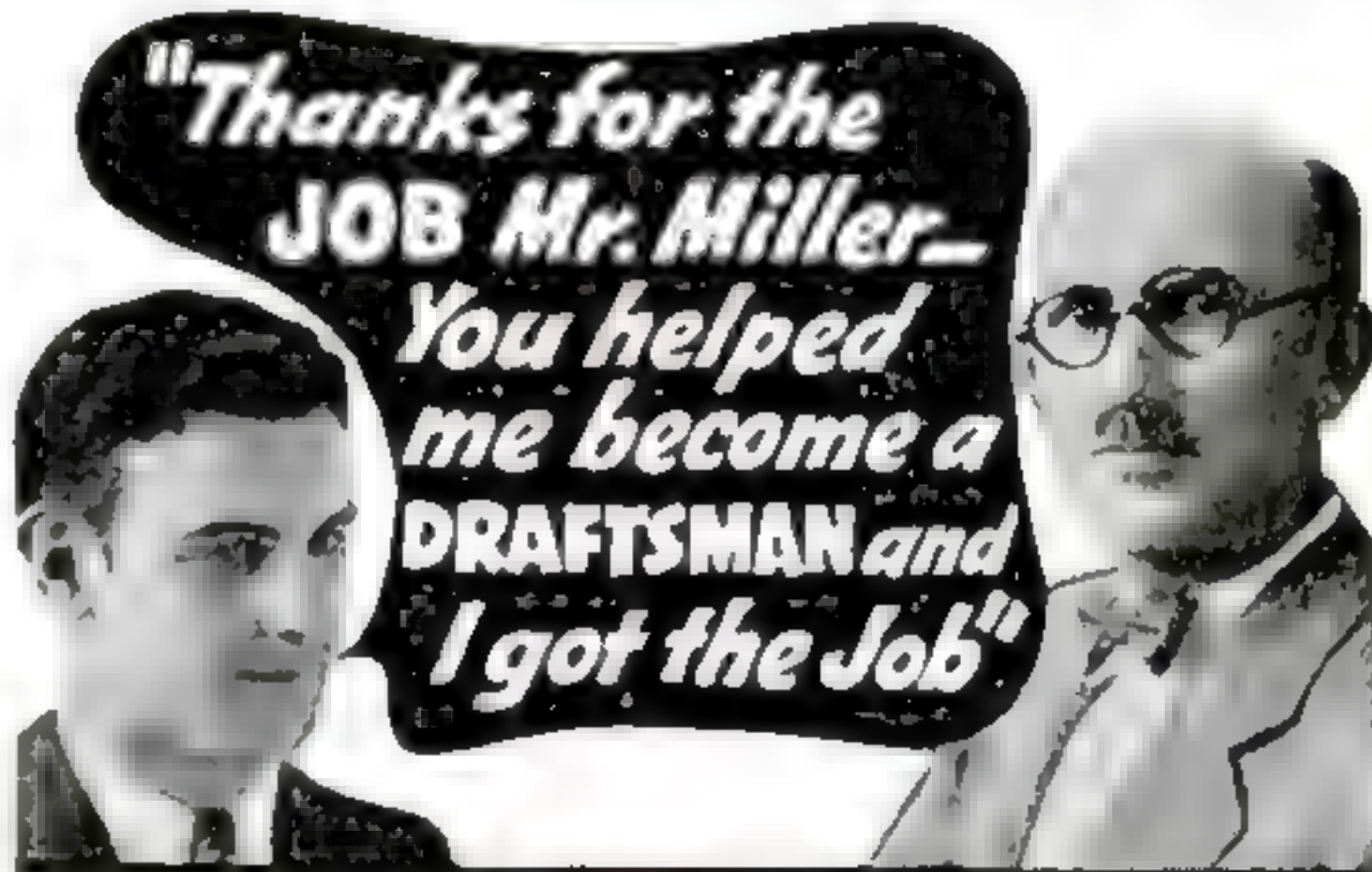
219 SNOW BUILDING, WASHINGTON, D.C.

Gentlemen: Please send me—without cost or obligation—your **FREE** books, "Suggestions on How to Commercialize Your Invention" and "How We Protect You." Also Certification of Invention form.

Name.....

Street and No.....

City or Town..... State .....



Thousands of letters like this have been written to prove that **DRAFTING**, learned the American School way, **DOES PAY**. Here's work you will enjoy, for it's great to see some huge plant or immense building taking shape on the drawing board and the draftsman expects **STEADY WORK** for he is usually among the **first to be hired** and the last to be laid off. Why not get into drafting—have a profession instead of a trade?

## Be a Draftsman —

**Learn at home** We train you thoroughly and expertly in the half hours you can spare from work or pleasure.

No need to burn midnight oil. Go as slow or as fast as your time will permit. Lessons are so clearly written that beginners can easily understand them and our system of "practice study" adds **EXTRA VALUE** to the instruction.

Use head and hands in this fascinating profession, to make **more money** and put yourself in line for promotion.

Write for **FREE** bulletin—there is no obligation of any kind,  
**O. C. MILLER, Secretary**

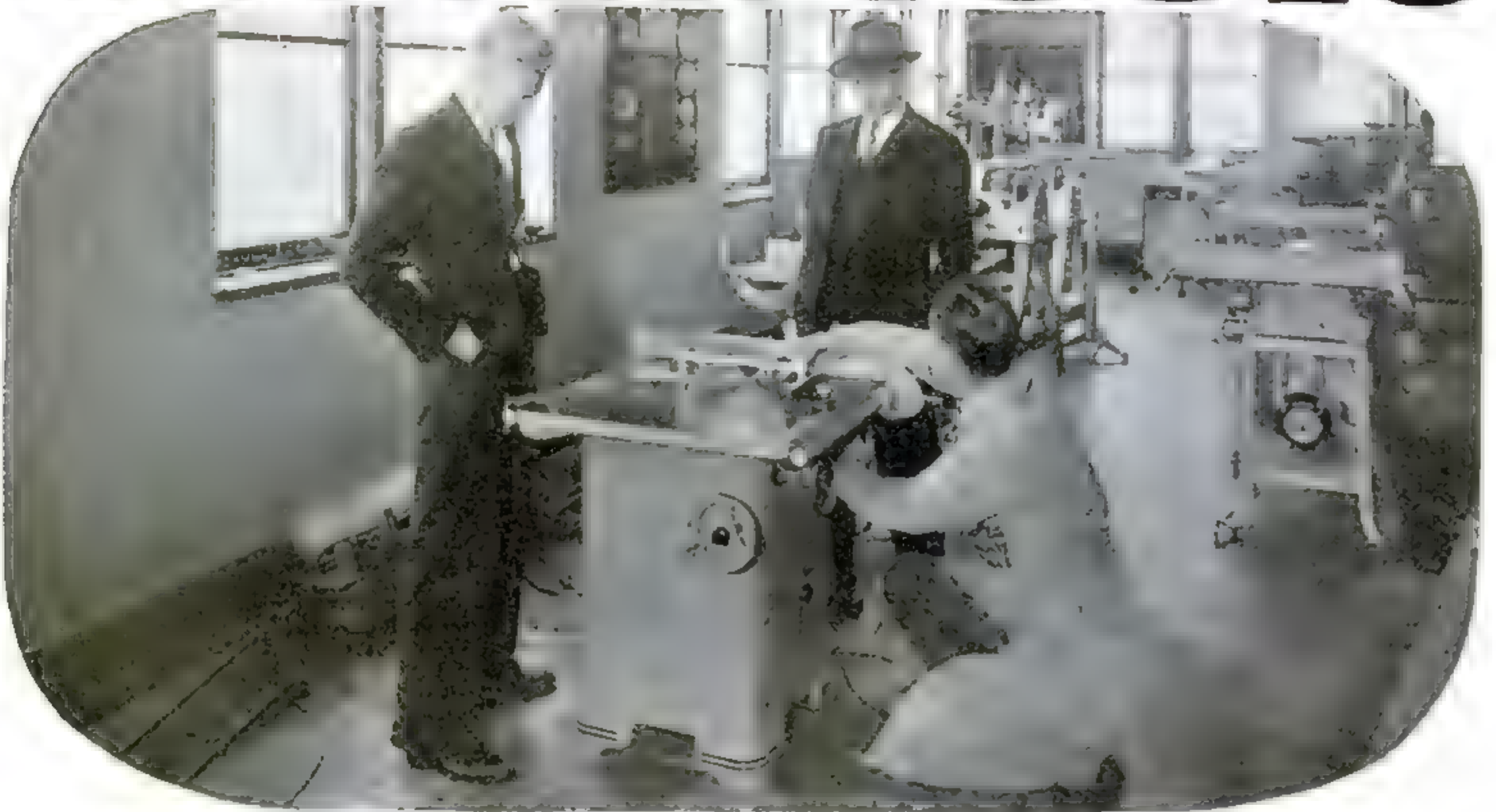
**AMERICAN SCHOOL**

Dep't. D D 146 Drexel at 58th Chicago

Please mention **POPULAR SCIENCE** when writing to advertisers.



# BETTER TOOLS



*Ask your DELTA Dealer to show you why*

## New Features in 1939 Delta Line

The 1939 line of Delta tools contains new tools, new improvements and new accessories that are of great interest to everyone concerned with power tools. Delta tools are *better* tools. Delta pioneered the original light power tool and has been responsible for practically every worthwhile improvement in motor-driven tools. Delta has utilized its wealth of experience and knowledge possessed by no other manufacturer and has developed its own high-production methods of precision manufacture that have brought light power tool prices down to the lowest levels in modern industrial history. Today—Delta is the largest manufacturer in the world making light power tools exclusively. For the complete Delta story—send coupon for the 1939 Delta Catalog.



**DELTA** MANUFACTURING CO.  
600-634 E. Vienna Avenue  
MILWAUKEE, WIS.

Whether your interest in light power tools is for the small workshop, the manufacturing plant, the school or the building field—you will be fascinated by the story of the engineering achievements embodied in all Delta tools. Any Delta dealer can prove to you graphically why Delta tools are BETTER tools. He can show you cross-section analyses of design and construction that will open your eyes to the full meaning of "Delta Quality." He can show you the facts about "diamond boring" of bearing seats, pre-loading of sealed-for-life ball bearings to precision limits, efficiency of drives, basically improved designs and exclusive engineering features that make for precision, long life, convenient operation and low cost. A check up of the new 1939 Delta line is a worthwhile lesson in modern engineering. See your nearest Delta dealer at once. He is conveniently accessible anywhere in the world.

## Send for CATALOG!

Send coupon below for 1939 Delta Catalog and complete list of Delta dealers nearest to you. (Craftsmen: Also send for new 1939 Project Book No. 5 crowded with new and "out of the ordinary" things to make. Send 10c with coupon for Delta Project Book No. 5 and 1939 Delta catalog.)

Delta Manufacturing Company, Dept. B 139  
600-634 E. Vienna Avenue, Milwaukee, Wis.  
Send me the new 1939 Delta Catalog and list of Delta dealers nearest to me.  
☐ I enclose 10c (stamps or coin) for which please send me the new Delta Project Book No. 5.

Name .....

Address .....

City ..... State.....

(☐ Check here if you are a Delta user now.)



*Monthly*  
RAYMOND J. BROWN, Editor

Radio feelers gauge the distance from a plane to the nearest point below, and register it on the dial

# Radio Altimeter

## PROMISES NEW SAFETY IN AIR TRAVEL

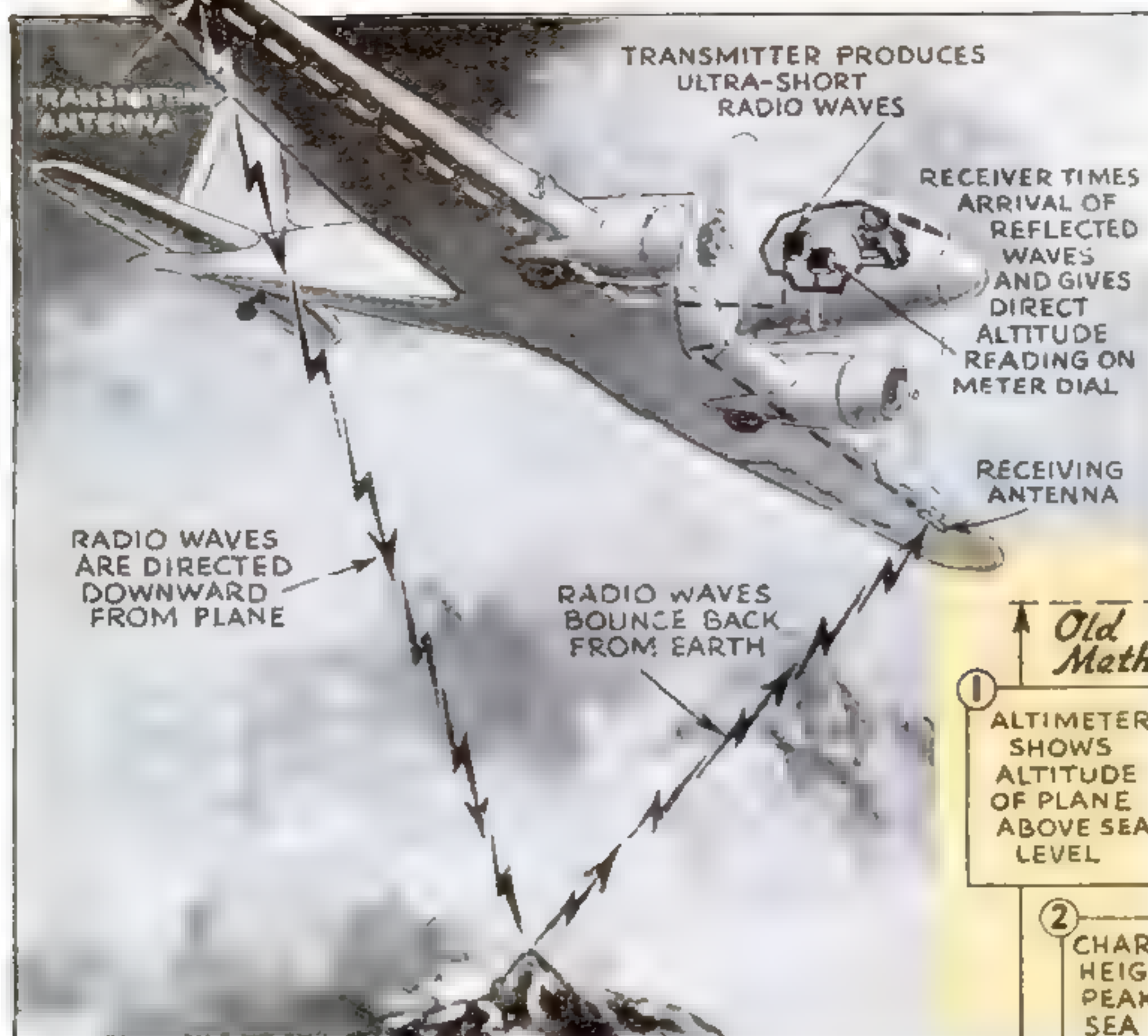
**A**BOARD a big United Air Lines plane, droning over New York City a few weeks ago, aeronautical engineers and news reporters witnessed the successful try-out of an instrument brand-new to aviation. Called a terrain-clearance indicator, or ra-

dio altimeter for short, it is declared the first practical device for registering directly the exact height of an airplane above the ground. Airmen hail it as one of the greatest contributions ever made to air safety.

If a pilot flies along an airway enveloped

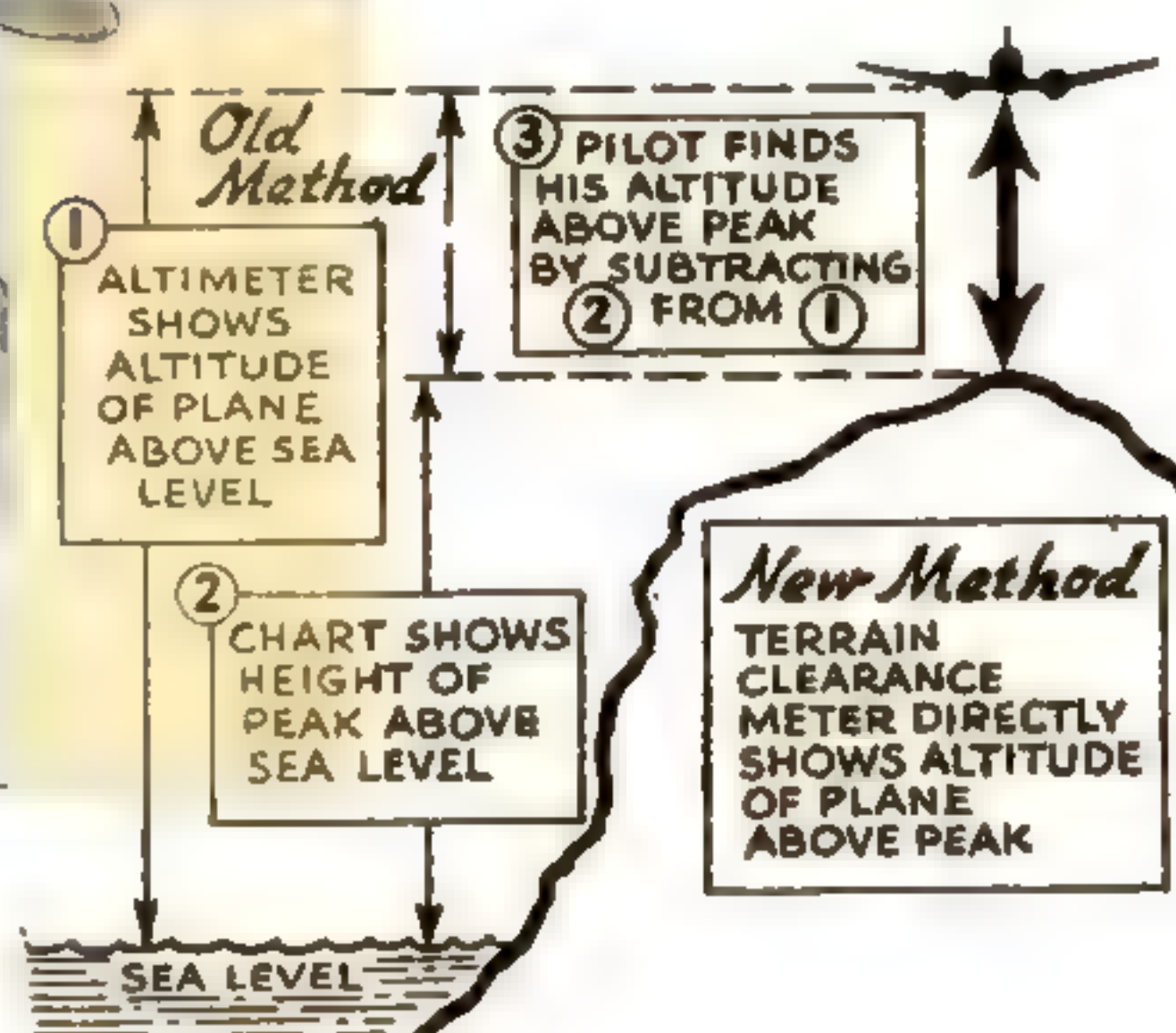
By **ALDEN P. ARMAGNAC**





## "ABSOLUTE" ALTITUDE

The drawing at the left explains how radio waves of ultra-high frequency bounce back to the plane from the ground below to measure the distance. Below, the simplicity of the new method is contrasted with the use of the conventional altimeter of the barometric type



in fog, the radio probe enables him to take constant "soundings" of the distance to earth, such as a ship takes of a channel. In case the fogbound plane is off its course, and the pilot is unwittingly approaching a mountain peak at dangerously low altitude, the new instrument warns him in ample time to gain elevation and avert a crash. When he descends at an airport in a blind landing, the radio feeler "senses" the approach to earth and signals exactly when the wheels will touch the ground.

Essentially, the new instrument consists of a transmitter that directs radio waves to earth, a receiver that catches them as they bounce back to the plane, and a timing device sensitive enough to clock the infinitesimal fraction of a second required for the round trip. A dial pointer translates the time interval directly into hundreds or thousands of feet from the ground.

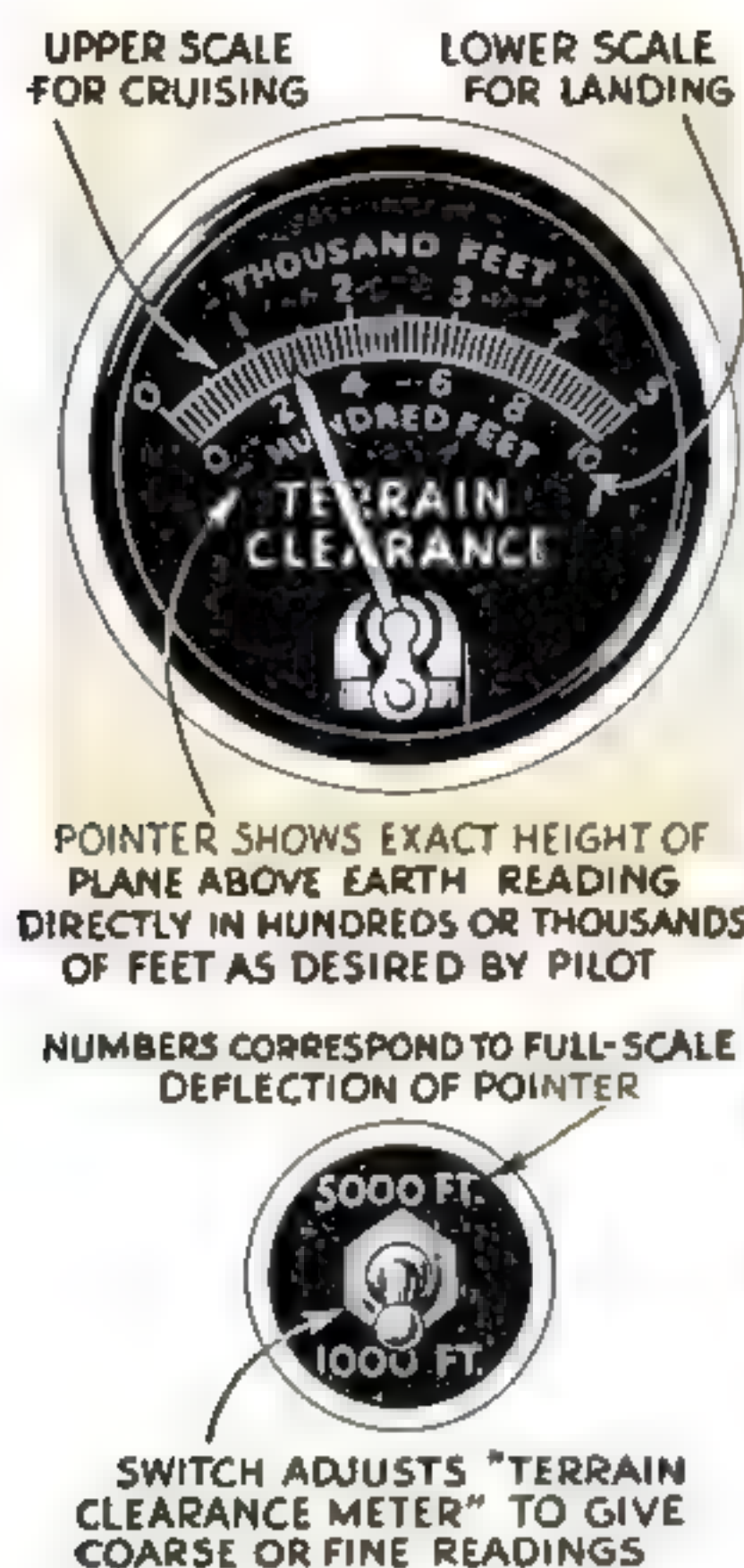
This actual or "absolute" altitude can be arrived at only indirect-

ly with an altimeter of the standard barometric type, which responds to diminishing air pressure with increasing height, and simply shows how high the plane is flying above some arbitrary level, such as sea level. To find his real height above any particular



One of the two antennas of the radio probe, set under the wings of the plane





Here the dial of the new instrument is set in a panel alongside that of the standard barometric altimeter. A switch, as shown at the left, gives a coarse or fine reading for the altitude

point on his chart, a pilot must also take into account the known elevation above sea level of that point. If he is uncertain of his location, he may misjudge his safety margin of altitude, and some of the major air disasters of recent years have been traced to this cause. In one case an airliner crashed head-on at full speed into a Utah peak that could have been cleared safely by flying only twenty feet higher! An accident like this would be impossible with the new radio probe. It also is free of other well-known drawbacks of barometric altimeters, including their susceptibility to weather changes that affect atmospheric pressure, and their tendency to lag behind when a plane changes altitude rapidly, as in landing.

**M**OUNTED side by side in an instrument panel for the recent flight test, the dials of a radio probe and a standard altimeter gave observers a striking comparison. Over the skyscrapers of New York City, the clock-like hands of the regular altimeter stood still, since the plane was flying a level course. But the pointer of the radio altimeter was dancing crazily across its dial. It was actually registering the distance from the plane to each of the rooftops below! Above the Hudson River, the pointer steadied at the figure shown by the altimeter—800 feet—but it dipped sharply for a moment as the plane passed over the high span of the George Washington Bridge which connects New York with New Jersey. When the airliner turned

from the river and crossed the towering cliffs of the Palisades on the New Jersey shore, with the altimeter still showing 800 feet, the pointer of the radio probe dropped to less than half that figure. During the final landing at Newark Airport, the radio probe instantaneously registered the progress of the descent, while the barometric altimeter, lagging behind, was still dropping after the plane had come to rest on the runway.

Plans have been announced by the United Air Lines to make the radio altimeter standard equipment on all its ships, as soon as preliminary tests have been completed. The present experimental model, developed in collaboration with engineers of the Bell Telephone Laboratories and Western Electric Company after years of research, employs a five-watt transmitter operating from the plane's generator. It produces radio waves of the highest frequency ever employed for practical purposes—500,000,000 cycles or oscillations a second—and this ultra-high frequency is declared to make it immune to static. How the instrument times the return of these waves from the earth has not been revealed in detail, but the method is understood to be based upon interference between the reflected wave and a faint wave that passes directly between the transmitting and receiving antennas. In addition to its telltale dial, the radio probe may be equipped with a red warning light that will automatically flash on when the pilot descends below a predetermined safe height from the ground.





## Town Is Moved 180 Miles on Barges

**H**AULED down the Tennessee River on barges, houses used by Tennessee Valley Authority workers at the Pickwick Landing Dam in Tennessee were recently transported 180 miles by water to the site of a new dam

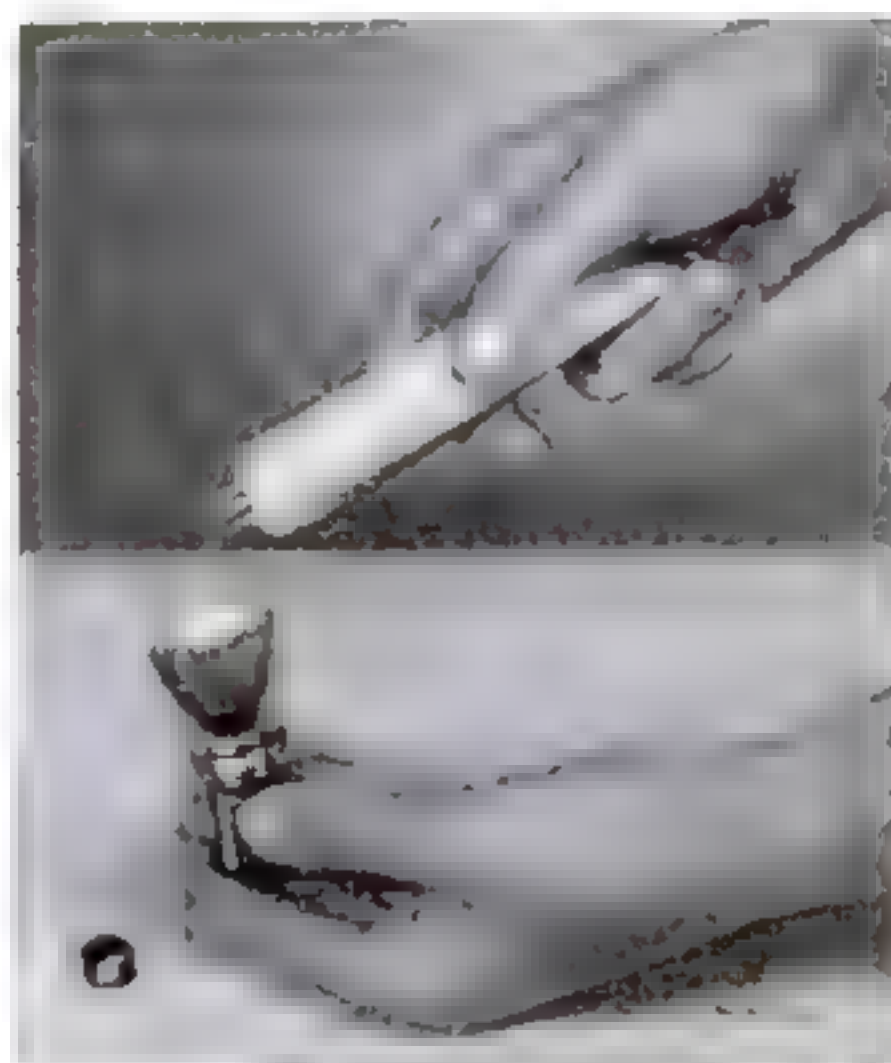
under construction near Paducah, Ky., where they were set up again on dry land for workers at that location. The photograph above shows a group of the dwellings on barges passing through a navigation lock.

## Steering Wheel Turns Merry-Go-Round

TO GIVE his son outdoor exercise in the back yard, a southern California man devised the odd one-boypower merry-go-round pictured below. An automobile steering wheel is geared to the central standard by a long shaft. By turning the wheel to the left or right, the boy can swing the machine around.



While one boy makes the carrousel go 'round, others can ride the platform



## Shaving Soap in Celluloid Tube

SHAVING SOAP in granulated form is now available for the first time in a novel transparent tube made of celluloid, which allows the user to see at a glance how much of the powder is left.



## Huge Register Will "Ring Up" Fair Visitors

TO TALLY the daily attendance at the World's Fair in New York City, a maker of cash registers is constructing the largest one in the world. As a visitor passes through the entrance gate, the forty-foot-high machine will "ring up" his arrival. Mounted on top of the company's exhibit building, it will revolve slowly upon a turntable so that its illuminated figures, of six-foot height, will be visible at all times both by day and night from every part of the fair grounds.



Daily fair attendance will be counted by this giant revolving cash register

## Easy-To-Work Anchor Reel

WITH the aid of a new anchor reel for small boats, a six-year-old child can easily pull a twenty-pound anchor from a muddy bottom. By winding up the rope outside, the device keeps the interior of the boat clean and dry, and facilitates removing weeds entangled in the anchor, as illustrated in the photograph reproduced below.



How the reel keeps a dirty anchor line outside boat



Placed in a tire, it looks like a spike . . .



. . . but it's only a very clever rubber imitation

## Rubber "Nails" Puncture Jobless Man's Problem

A FRIEND'S dismay on finding a large nail protruding from a brand-new auto tire gave a jobless Alhambra, Calif., man an idea that is earning him eighteen dollars a day. From scraps of go-cart tires, inner tubes, rubber cement, and aluminum paint, he concocted harmless rubber "nails" that can be pinched into the tread of a tire when the owner isn't looking. Practical jokers took to the scheme, and its originator is now manufacturing the "nails" to fill an order from a Los Angeles firm for 5,000 of the novelties.



# Where Freight Cars Go When They Die

The end of the long run.  
This freight car is to  
be burned for its metal



A huge crane tips the wooden body off the heavy metal trucks

**W**HAT happens to railroad freight cars that have outlived their usefulness? The photographs on this page show activities in a freight-car graveyard where the wooden bodies are tipped off their wheel trucks, and set afire to burn off the wood, paint, and grease. This leaves the valuable metal parts exposed for recovery as scrap, of which each car yields some fourteen tons worth about seventeen dollars a ton. Cars are burned late in the day so that metal parts will be cool enough to handle by morning. In one scrapping plant alone, more than twenty cars can be dismantled in a day.



Wheels are pushed off their axles by this powerful press. Below is the funeral pyre in which old car bodies are consumed, leaving their skeletons of scrap metal worth nearly \$250 apiece



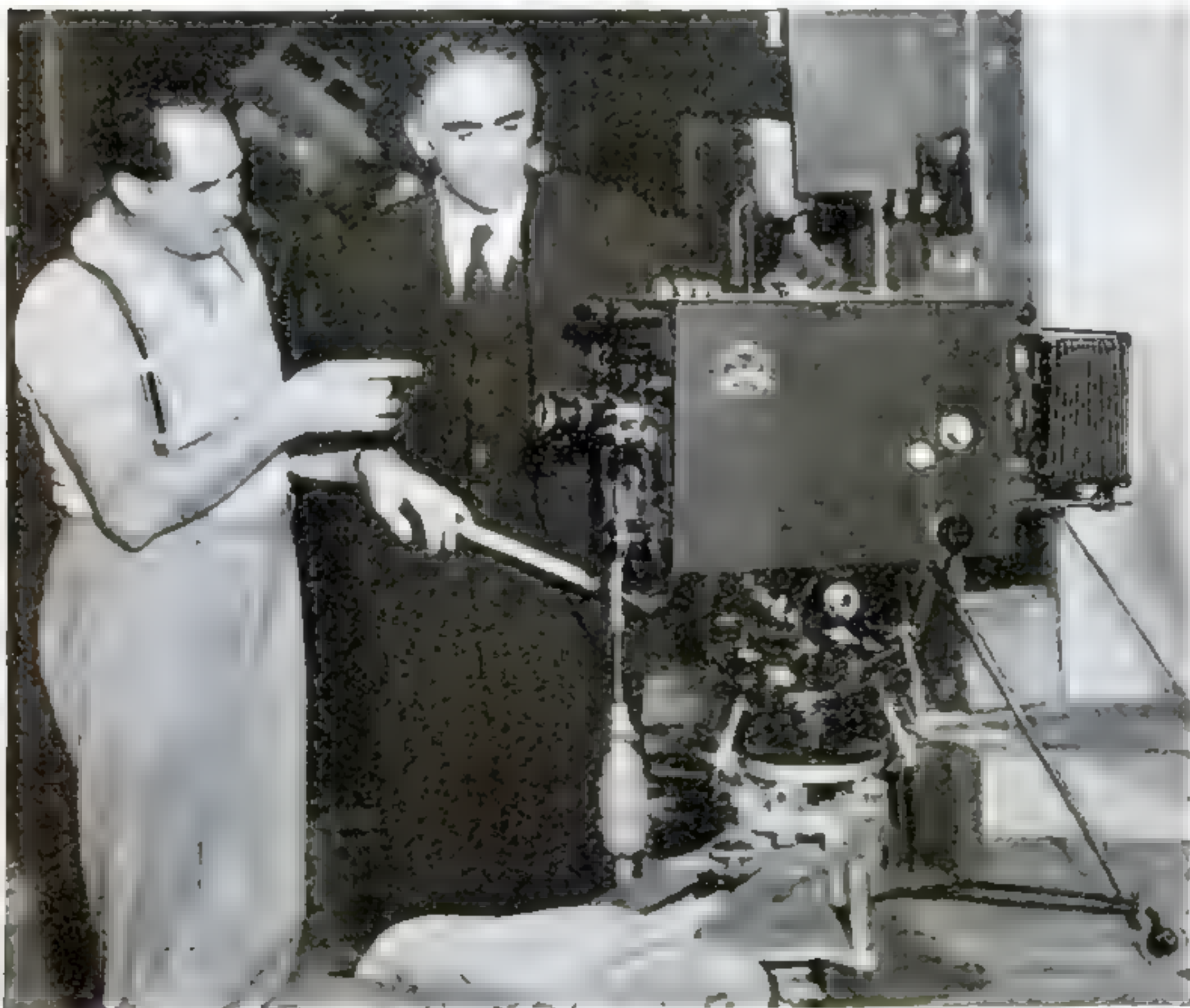




Youngsters get a thrill as the futuristic "rocket ship" inflates their toy balloons

## "Rocket" Tank Fills Toy Balloons

**T**OY BALLOONS are inflated to order, for children who visit the zoo in New York City's Central Park, with the aid of a rubber-tired wagon patterned after an imaginary rocket ship of the future. The device is provided with a valve like that of a drinking fountain, and its attendant simply presses a button until a balloon held over a nozzle is filled. A cylinder within the "rocket ship" contains compressed helium gas to make the balloons lighter than air.



Boris Karloff and cameraman examine the new lightweight movie camera

## Movie Camera Has Novel View Finder

**CALLED** the first of its kind, a lightweight motion-picture camera just introduced in Hollywood tips the scales at ninety-five pounds, or less than one fourth the weight of most sound-tight models. One of its mechanical refinements permits the cameraman to view the scene directly through the film. This avoids difficulties that arise, especially in close-up work, from the difference in point of view between the lens and a view finder set at one side of the camera.



# Blindfolded Men Train Dogs

**T**HIRTY days of darkness—a month of eating, drinking, shaving, and working while blindfolded—is part of the unusual training given instructors at the Seeing Eye farm in Morristown, N. J. These men train

the German shepherd dogs which now act as guides for the sightless in almost every state in the Union. It takes four months to train a dog, but it requires almost four years to school an instructor in all the branches of his highly specialized work.

The blindfolded training comes first. It enables a beginner to understand the problems of the sightless. During this period, he is guided about by one of the veteran dogs at the farm. Afterwards, years of classroom and practical training teach him the fine points of his unique profession.

Mealtime for future instructors at the Seeing Eye farm. A "month of blindness" is a part of their training



This dog is being trained to pick up anything that its companion drops. Starting with large objects, it learns to retrieve things even as small as a dime



Seeing Eye dogs are taught to disobey orders when it is necessary for the safety of their masters. Here a dog is refusing to approach an open manhole



# for the Sightless

It costs about \$900 to train a Seeing Eye dog. Only females are used, and the work begins when the animals are one year old. Dogs are taught to lead their companions through traffic, around open manholes, away from low awnings and other obstructions. They stop at each curb for their masters to step up or down. They disobey commands if obedience would lead their companions into danger. They are, in a word, eyes for the blind.

At the end of the dog's training period, the instructor dons his blindfold again and lets the animal lead him through city traffic. A second instructor, without the blindfold, follows to observe the actions of the animal under tests. Before a dog leaves the farm, its future owner spends a month or more at Morristown, becoming accustomed to its guidance.

How successful is the work of these Morristown trainers is shown by the fact that, two years ago, a blind student at the University of California hitch-hiked his way from coast to coast without an accident, guided by his Seeing Eye companion.

Examination day. Before a dog is "graduated," it must prove its reliability in actual traffic tests



A trainer teaching his guide to stop at every curb. This warns a blind master to step up or down. At a corner the dog halts to be told which way to go





# NAMING THE NAVY

AIRCRAFT CARRIERS:

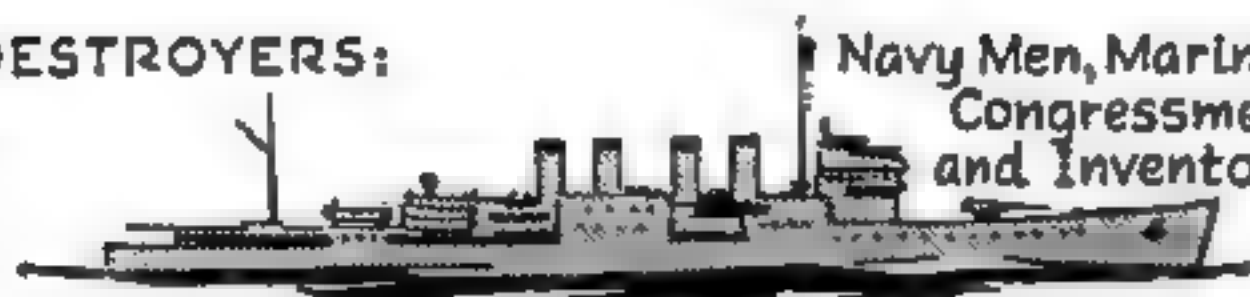
Historic Vessels  
or Battles



*Enterprise*

DESTROYERS:

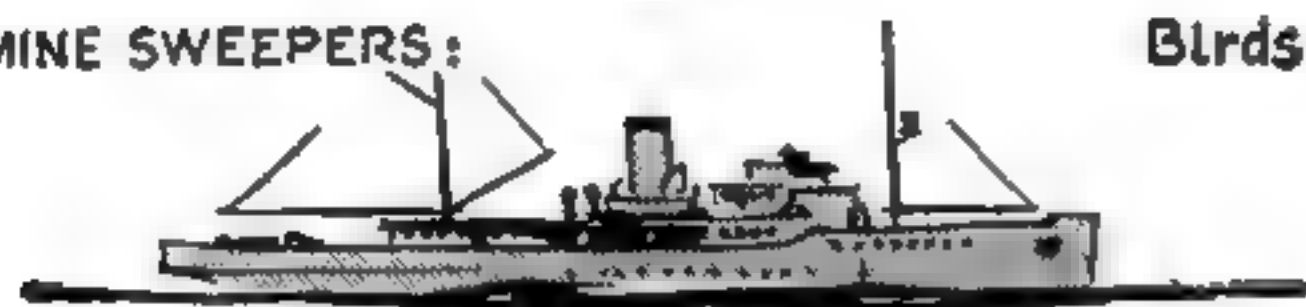
Navy Men, Marines,  
Congressmen,  
and Inventors



*Benson*

MINE SWEEPERS:

Birds



*Osprey*

REPAIR SHIPS:

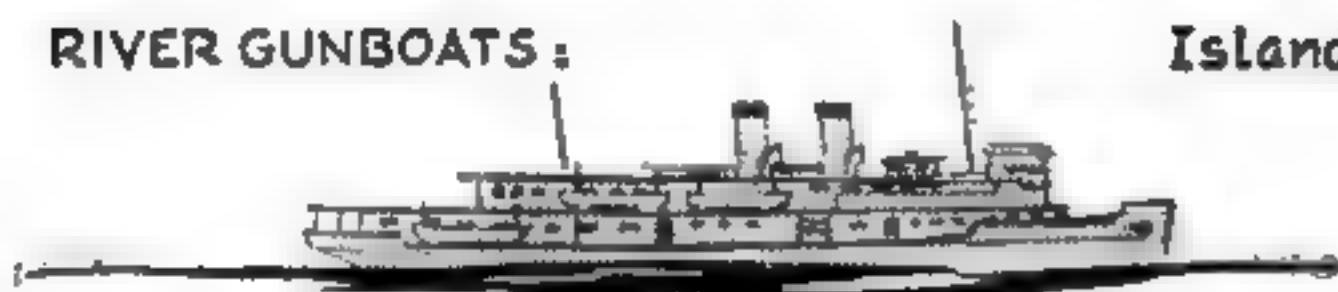
Mythological  
Characters



*Medusa*

RIVER GUNBOATS:

Islands



*Oahu*

DESTROYER TENDERS:

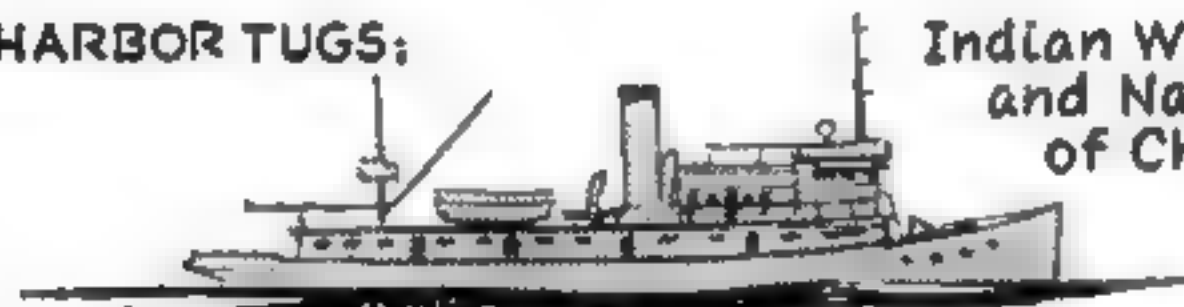
Natural Areas  
of the U.S.



*Prairie*

HARBOR TUGS:

Indian Words  
and Names  
of Chiefs



*Powhatan*

OCEAN-GOING TUGS:

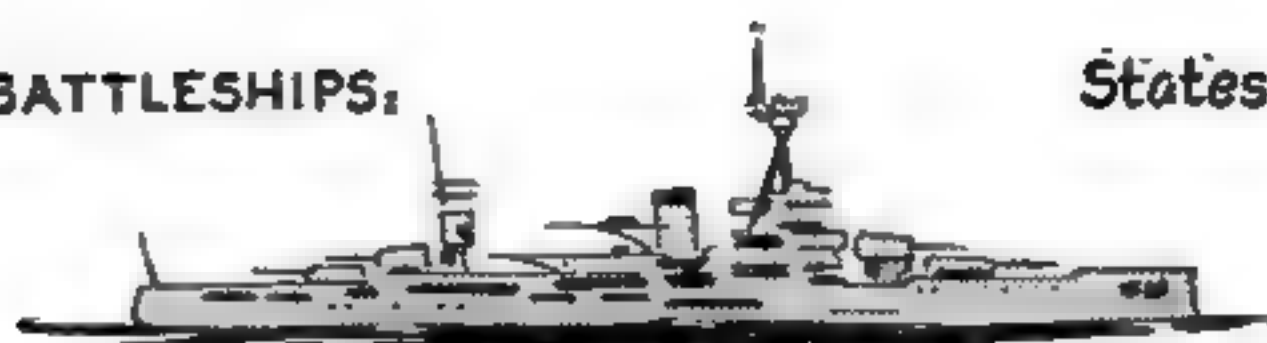
Indian Tribes



*Seminole*

BATTLESHIPS:

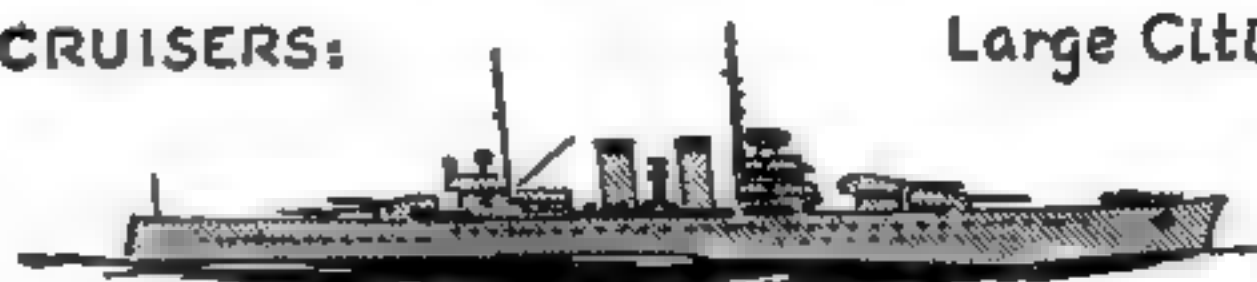
States



*North Carolina*

CRUISERS:

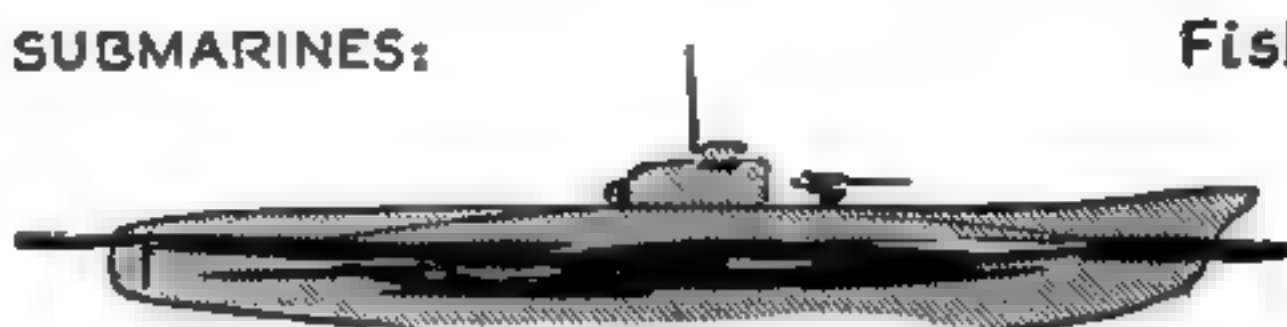
Large Cities



*Philadelphia*

SUBMARINES:

Fish



*Tuna*

SUBMARINE TENDERS:

Pioneers of  
Submarine  
Development



*Holland*

CARGO SHIPS:

Stars



*Sirius*

OILERS:

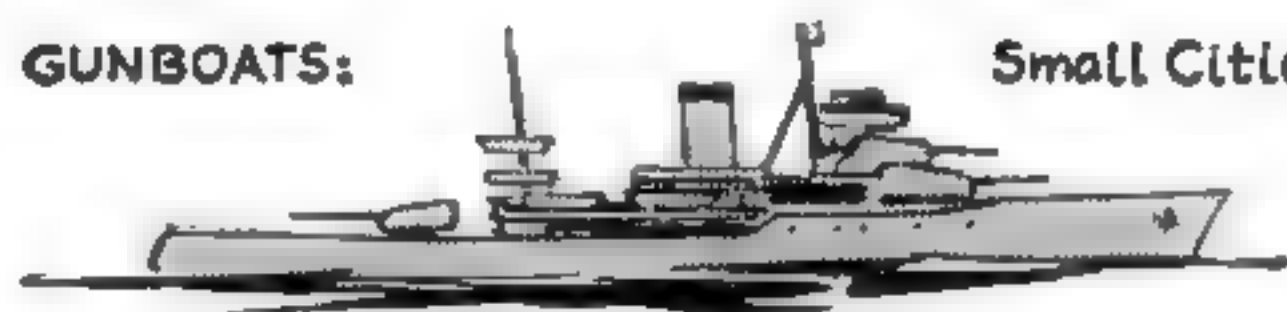
Rivers



*Platte*

GUNBOATS:

Small Cities



*Erie*

SMALL SEAPLANE TENDERS:

Bays, Straits,  
and Inlets



*Barnegat*

LARGE SEAPLANE TENDERS:

Sounds



*Albemarle*

**N**AMING a baby is a minor problem compared with picking a name for a new U. S. warship. So the Navy Department has just announced its adoption of the standardized procedure illustrated here. Previous tradition will be followed as far as possible, as in naming battleships after

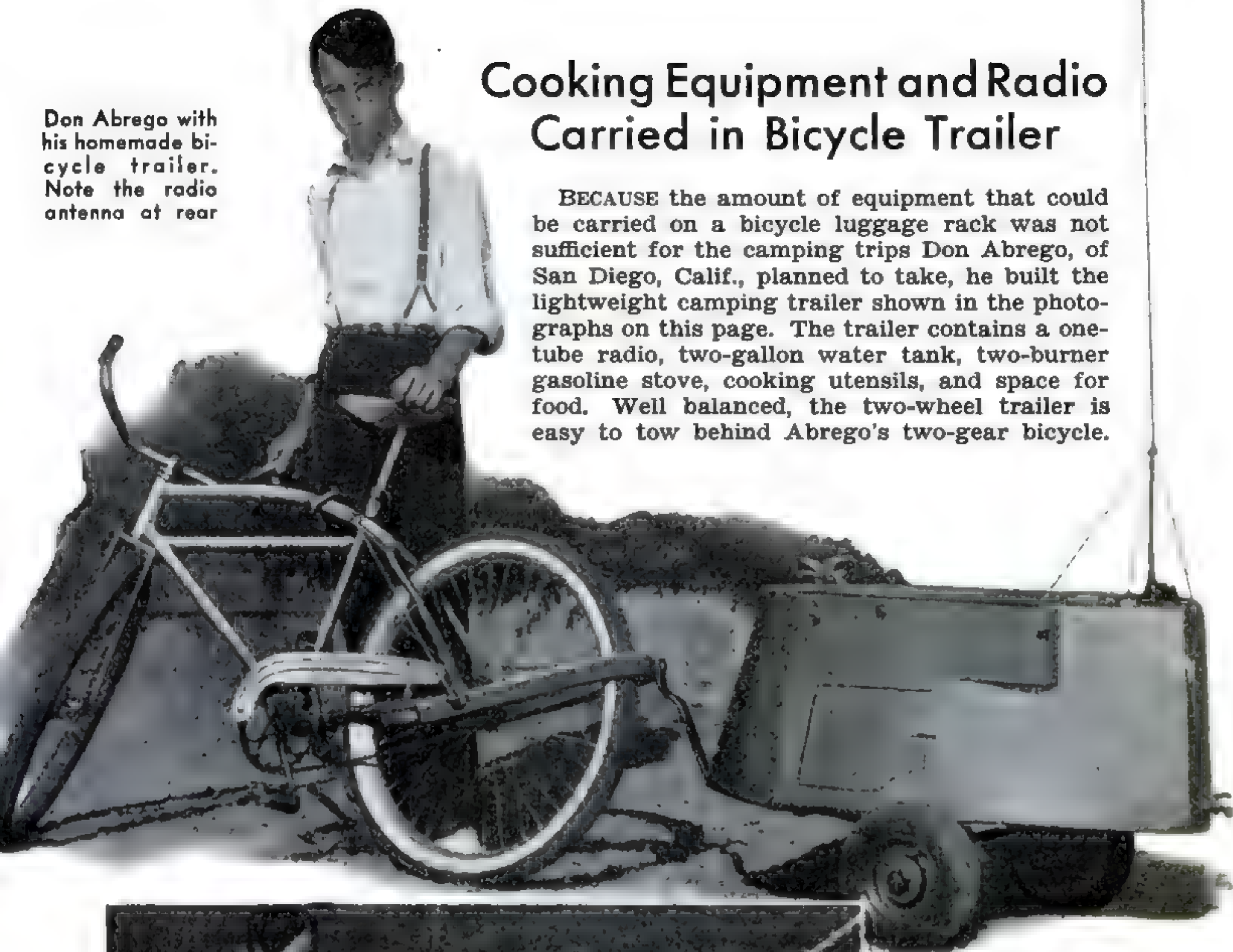
states; thus the Navy's four projected 35,000-ton battleships will be known as the *Alabama*, *Indiana*, *Massachusetts*, and *South Dakota*. Rules have been added to cover new types of auxiliary vessels. These drawings show types of ships, sources chosen for their names, and typical examples.



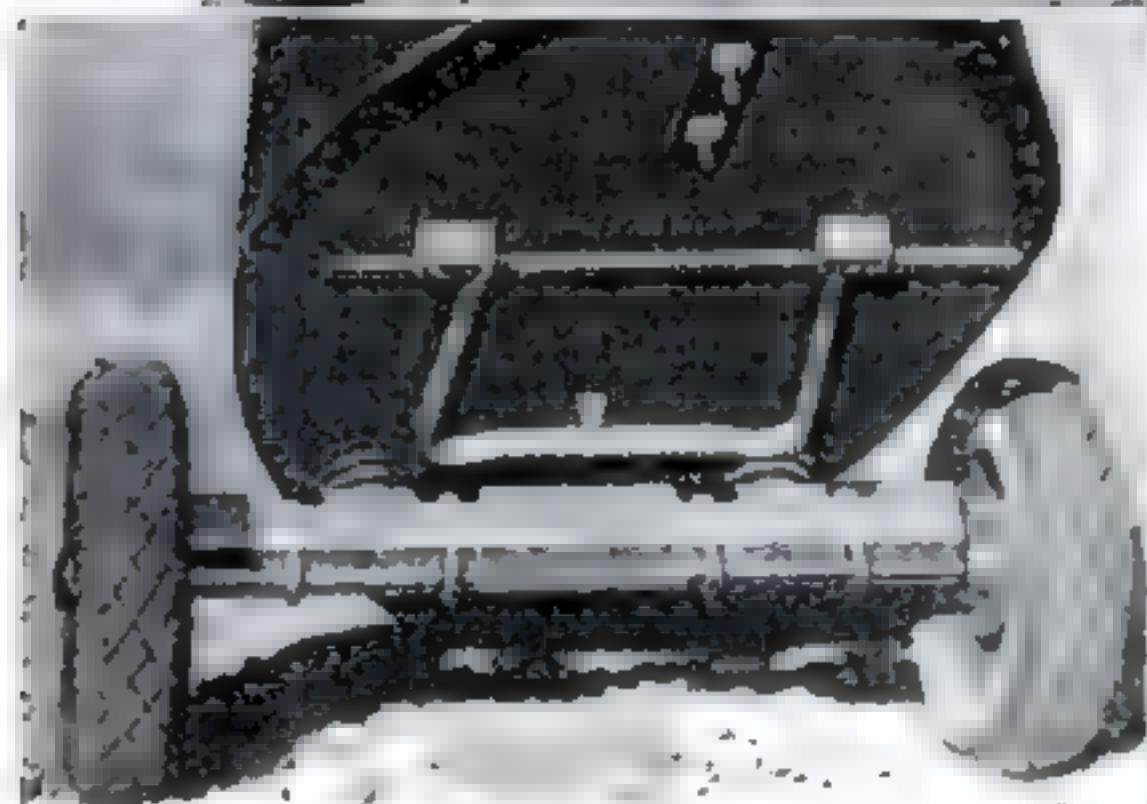
Don Abrego with his homemade bicycle trailer. Note the radio antenna at rear

## Cooking Equipment and Radio Carried in Bicycle Trailer

BECAUSE the amount of equipment that could be carried on a bicycle luggage rack was not sufficient for the camping trips Don Abrego, of San Diego, Calif., planned to take, he built the lightweight camping trailer shown in the photographs on this page. The trailer contains a one-tube radio, two-gallon water tank, two-burner gasoline stove, cooking utensils, and space for food. Well balanced, the two-wheel trailer is easy to tow behind Abrego's two-gear bicycle.



At the left, Abrego draws water from the two-gallon tank in the unit. There is space for food and utensils



Underside view, showing the axle mounting, springs, and parking stand. The trailer is towed easily



Here the young camper is listening to a radio program while he cooks a meal on the built-in, two-burner gasoline stove





Beauty by radio. Through this weird mask, short waves are sent through the skin to remove facial blemishes



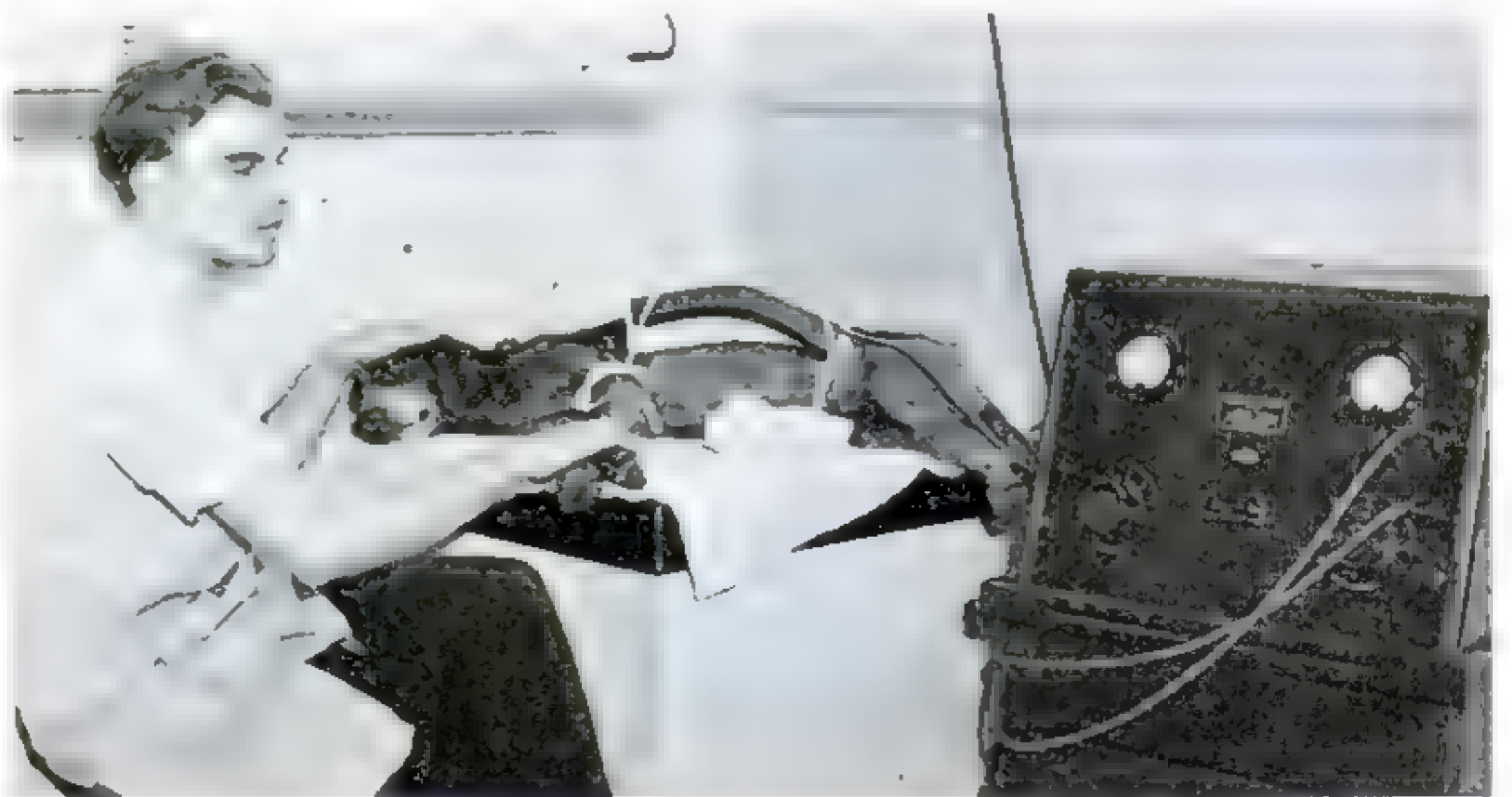
**M**ANY people think of radio merely as the mysterious force that brings music and entertainment to the receiving sets in their living rooms. But scientists and inventors every day are finding new applications for this jack-of-all-trades, not only in its original field of communications but also for uses ranging from curing sick cattle to removing blemishes from women's faces.

When prize cattle on a California ranch were dying like flies in an epidemic of pneumonia, not long ago, the owners decided to take a long chance. They had heard about radiowaves being used to treat similar ailments in human beings; it might work on cows. Hastily procuring the necessary apparatus, they sent

high-frequency waves coursing through the lung areas of the animals. Five days later, all the cattle were practically well.

Radio is even being put to use by the chemists. French scientists have found that many chemical reactions can be speeded up by shooting radio waves through copper coils that form nests for the test tubes or flasks containing the reagents. This process even brings about some reactions that otherwise would not occur at all.

Radio is being used extensively for the treatment of animal diseases. Here a dog is being cured with a special apparatus



## ● SCIENTIFIC JACK-OF-ALL-TRADES FINDS ODD USES,



More romantic is the use found for radio by a beauty shop in Hollywood, Calif. To remove pimples, skin blotches, and other facial blemishes, a weird-looking mask is clamped over the customer's face. When a switch is thrown, high-frequency waves flow through the skin.

When the Baltimore & Ohio Railroad suffered loss through insects infesting stored grain, an electrical engineer brought short waves into play against the pests. He found that radiations sent through the grain quickly destroyed the insects.

Pet hospitals are making extensive use of short waves in treating dogs and cats for ills that range from sore throats to bone bruises.

Lee De Forest, famous pioneer radio inventor, has been carrying on experiments to test the value of these radiations in curing sprains in horses.

Lee De Forest, famous inventor, testing the effect of radio on a strained tendon in a horse's leg

Looking into the future, radio promises even more amazing things. According to one dental expert, it will not be very long before radio waves will be used as a cure for toothache. An eastern poultry raiser, experimenting with the effect of radio entertainment on the egg production of his hens, prophesies that chickens as well as cows on the farms of tomorrow will be spurred to greater efforts by loudspeakers that blare the music of a "swing" band.

Delegates and reporters at an international conference heard the speeches through short-wave receivers



**FROM CURING COWS TO MAKING WOMEN BEAUTIFUL ●**

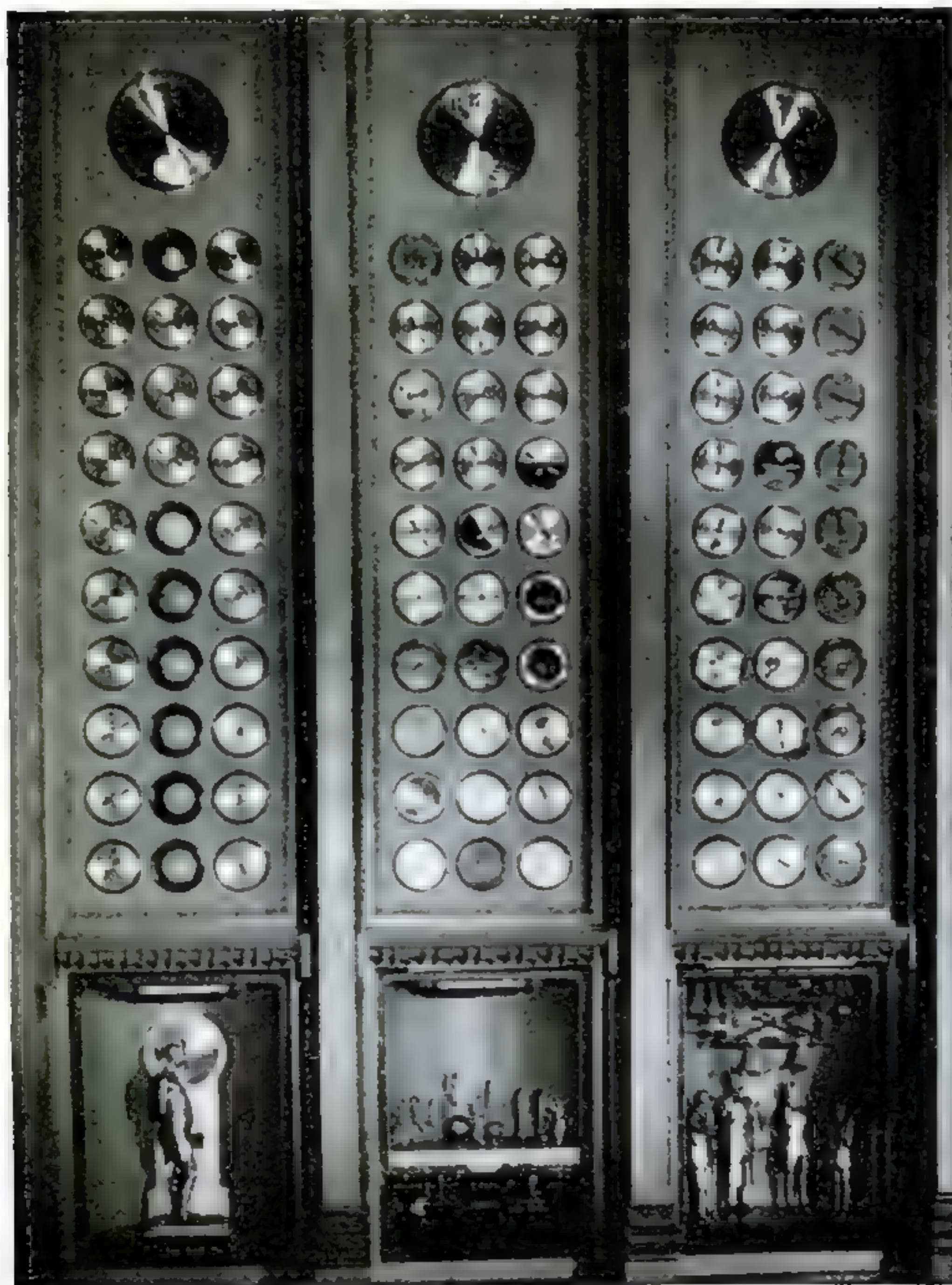


## Buys the Blarney Stone — Ten Tons of It

WHEN Manfred Meyberg, of Los Angeles, Calif., jokingly ordered an Irish friend to buy the Blarney stone for him, he got more than he bargained for. What he meant was the famous stone in the wall of Blarney Castle, Ireland, which is supposed to bestow the gift of gab on anyone who kisses it. To his surprise, his friend responded by notifying Meyberg that he was shipping 20,000 pounds of rock from the Blarney quarry, from which the famous stone presumably came. At the right, Meyberg is letting an American colleen test a chunk of it.



## Mammoth Clock Has Ninety-Three Dials

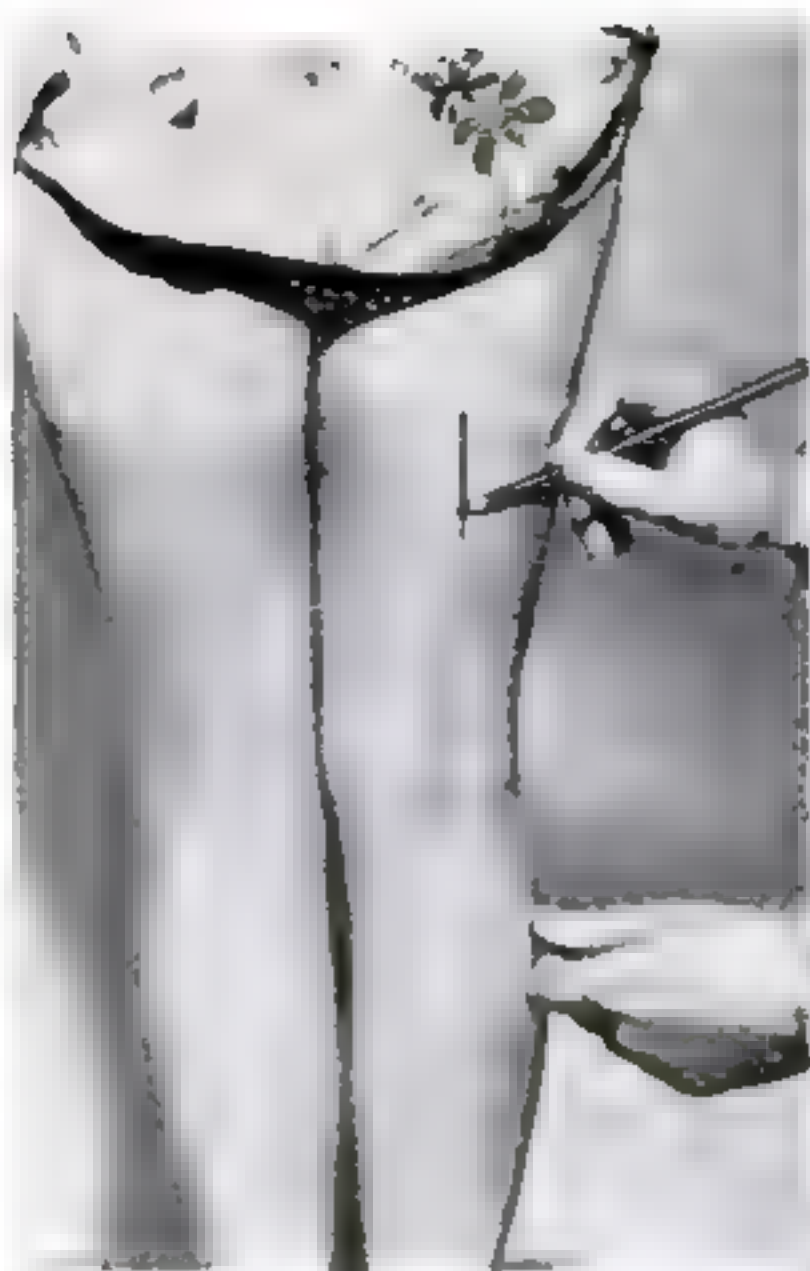


"Face" of the giant clock. At the right, the builder points to an indicator that moves at the rate of one revolution in 26,000 years

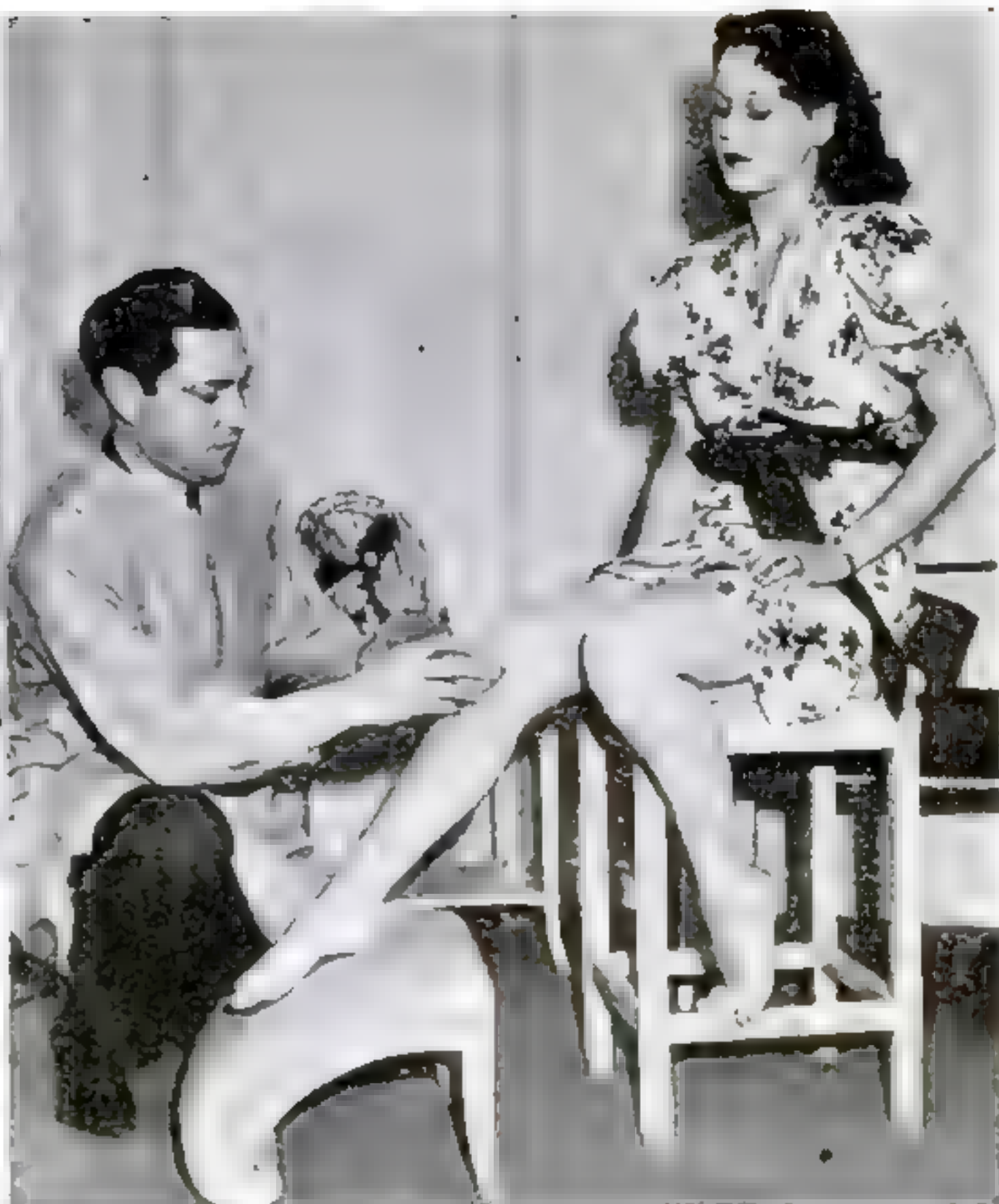
NINETY-THREE dials dot the face of a sixteen-foot, 450-pound clock constructed by Lodewyk Zimmer, clockmaker to the King of the Belgians, and now on display in New York City. Electrically controlled by one master movement, the giant timepiece records astronomical changes, tides, world-wide time, and other data. The indicator on one dial moves at the rate of one revolution every 26,000 years. On another the needle whirls around 100 times a second.







Make-up that looks like real silk is applied to the legs with a sponge. Seams and clocks are then drawn in with a special cosmetic pencil



## Make-Up "Stockings" Can't Run

**M**AKE-UP takes the place of silk in novel stockingless hosiery recently developed by a Hollywood make-up expert. A specially made preparation, applied with a damp sponge, is spread thinly and evenly over the bare legs. When it dries, the substance is said to be almost identical in appearance with sheer silk

hose. To increase the realistic effect of the runless, wrinkleproof "hose," a seam is penciled down the leg with another special make-up material. Though it may be removed easily with soap and water, the stocking cosmetic will not come off on clothing and will not run or cake from the effects of perspiration, the makers claim.

## Airport Tests Cotton Runways

**AIRPLANES** are now taking off and landing on cotton runways at Reilly Field, Fort McClellan, Ala. As an experiment to determine the efficiency of cotton as a base for hard-surfaced roadways, large quantities of the material in the form of a woven cloth were laid down on the airport on an underlying base of tar. The cotton was then covered with asphalt and rolled down to form a smooth, even runway surface.



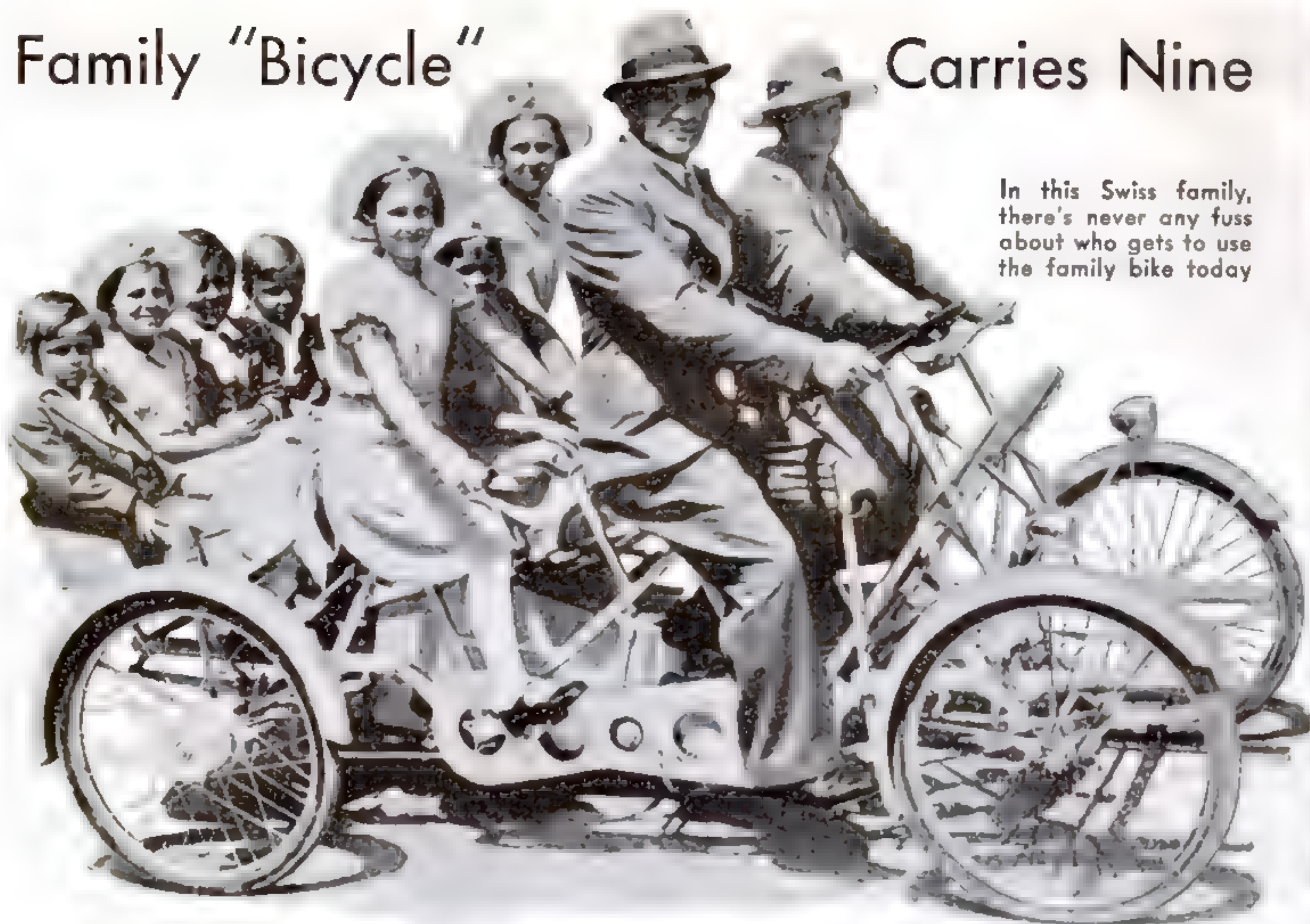
Laying airplane runways of cotton at Reilly Field to test its efficiency



# Family "Bicycle"

# Carries Nine

In this Swiss family, there's never any fuss about who gets to use the family bike today



**A** CYCLING enthusiast of Dnedingen, Switzerland, takes his family on Sunday outings on a "bicycle" built for nine. His curious vehicle, which has four bicycle-type wheels, is pedaled by the man, his wife, and their three older children, while the four younger offspring bounce happily

along on the wide rumble seat built over the rear wheels. The two front riders guide the contraption by means of steering wheels like those used on automobiles.

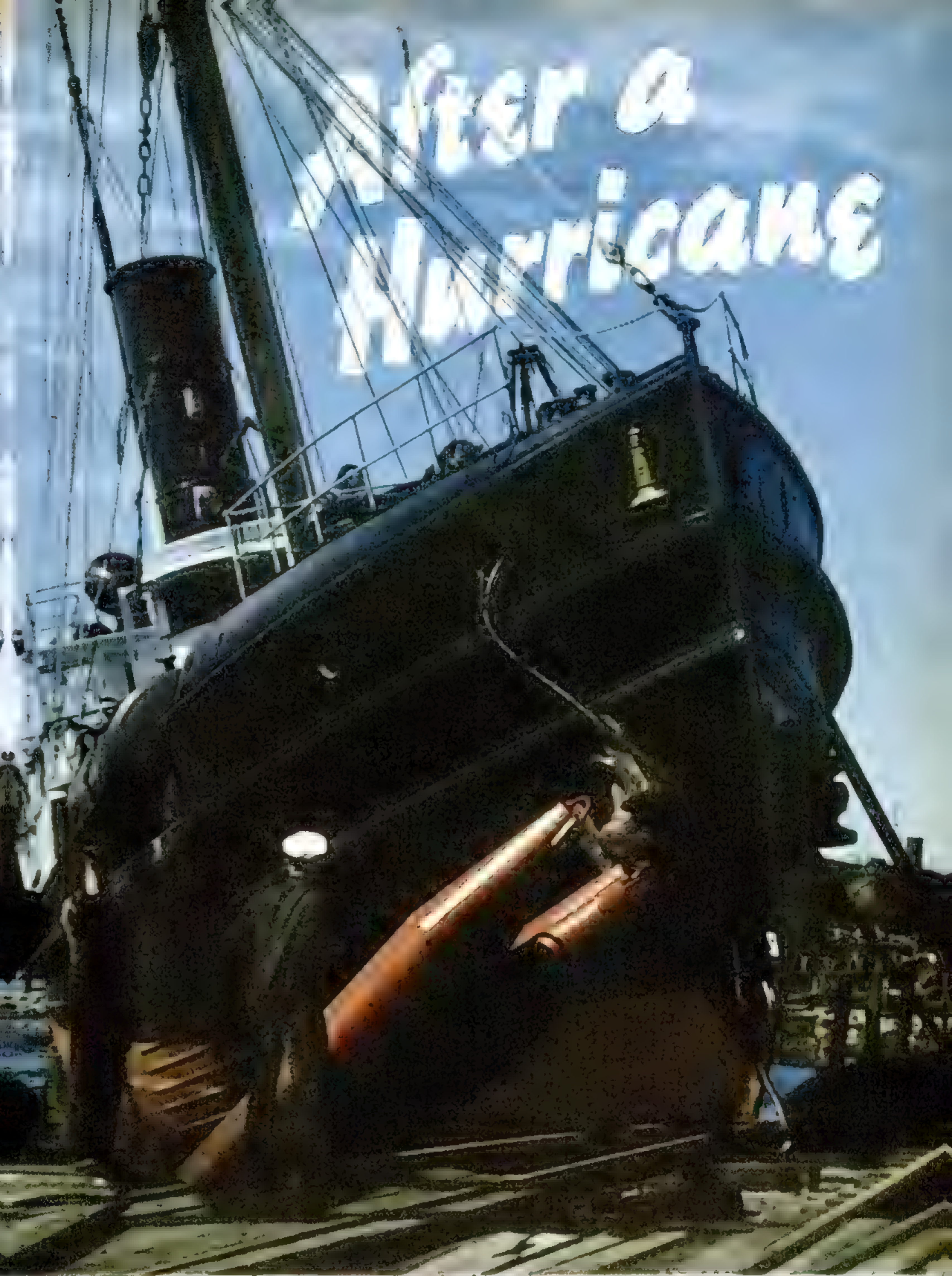
## Camera Car Gets Dope on Fast Drivers

To CHECK UP on the safety with which truck and private-car operators drive, a large insurance company has furnished its investigators with a novel photographic test car. A camera is mounted just above the windshield of the automobile and aimed so that it will snap not only the car being followed but also a special speedometer attached to the test car's left front fender. A button on the steering wheel controls the camera shutter. An example of how the arrangement works is pictured at the left. Checking up on a truck, the inspector has snapped the test-car camera to show that the truck driver was going sixty miles an hour past a warning sign which plainly limits speeds on this particular stretch of road to thirty miles an hour.



Photographic evidence against a speeder





Color Pictures By Our Flying Photographer Show  
How Relief Forces Mobilize When Disaster Strikes





U.S. Coast Guardsmen loading a Lyle gun in preparation for shooting a temporary telephone line across a river



Fire! The projectile whizzes away, dragging the light line that will haul electric wires across

## By RUDY ARNOLD

Color Photographs by the Author

**S**WINGING like a scythe across six northeastern states, recently, a freak hurricane mowed down whole villages, hurled waves three stories high at the shore, felled billions of feet of timber, and left behind 682 persons dead, 10,000 families in want, and damage far in excess of \$50,000,000. During the sixty hours that followed, I was working at top speed, racing from scene to scene by plane, car, and boat, photographing for *POPULAR SCIENCE MONTHLY* the whole dramatic activity of an army of relief workers that battled want, hunger, and suffering in the wake of the whirling winds.

During the night of September twenty-first, the hurricane blew itself out. At dawn, the

next morning, I was loading my color camera and climbing into the cabin of a red and black Waco biplane at Floyd Bennett Field, New York City. With a friend of mine, "Rip" Strong, at the stick, we lifted from the soggy airport and headed east. The Coast Guard base, at the far side of the field, passed below us. It was a beehive of activity. Mechanics were wheeling planes from the hangars. Pilots were preparing to fly serums, food, and medicines into the stricken area. A giant silver flying boat was sliding into the water for a flight up the coast.

Traveling at two miles a minute, we soon crossed the trail of the great winds. Acres of trees were scattered about like matchsticks. Automobiles were lying on their sides, half buried in sand. Houses were flattened out as though they had been crushed under steam rollers. Near the far tip of Long Island, we glimpsed a coupe half submerged in water.



Coast Guardsmen rushing a survivor to an ambulance. Prompt attention was necessary to keep exposure and disease from claiming more lives



Winged messenger of mercy—a Coast Guard plane taking on a load of serum to be flown to the stricken city of New London, Conn., for use in fighting disease



sharp branches punctured the tires. Trucks, carrying Red Cross supplies and bearing huge signs: "EMERGENCY RELIEF," lumbered along in front of us. Once, in the glare of our headlights, we saw a great white yacht tossed up on the roadway. It was dawn when we reached New London, Conn., our goal.

Everywhere I turned, in this stricken city, there seemed to be a picture. National Guardsmen were patrolling the streets; WPA crews were searching wreckage for victims; Red Cross workers were setting up feeding stations and injecting serums against typhoid and tetanus; Coast Guard pharmacists were testing the purity of drinking water. For hours, my camera was busy. Then we started back for New York.

Searching the ruins at Saltaire, N.Y. Located on a barren spit of sand, this town felt the full fury of the hurricane

With traveling conditions better, we reached home early in the afternoon. I had hardly eaten since the morning of the day before and I was groggy from lack of sleep. But, I had a dozen rolls of color pictures. They, however, did not tell the whole story. So, as soon as I could get a sandwich and a fresh supply of Kodachrome film, I climbed aboard the Waco for what proved to be the most exciting trip of all.

At the start, we cut across Long Island and swung up the New England coast along the route we had followed by car. Now, we saw the full effect of the hurricane. At one spot, nearly fifteen houses were whirled together as though they had been in the grip of a giant egg beater. At another place, a yacht was resting on a front lawn with a five-foot hedge between it and the sea. Near Madison, Conn., there was the strangest sight of all—a two-story



Here food is being distributed. Fokker flying boat.







for bodies in wreckage strewn along the shore.  
es were common on the battered Long Island coast



This surfboat is being taken across-country on a trailer to  
the place where it will be put into service for rescue work







Rescue workers search for survivors in wreckage at Saltaire, a hard-hit resort community on Fire Island



All Coast Guard men were inoculated against typhoid before going on relief duty



Looking at Saltaire. Such scenes

Two people were leaning out the windows, apparently waving at us. We swooped close and saw that the machine had been overwhelmed and both occupants drowned.

As the morning advanced, the light became better and I was able to shoot my pictures at 1/100 and 1/125th of a second. On the way home, we swung out over Fire Island, where the terror and destruction had been greatest. Wide channels had been cut across the land by the fury of the sea, and whole communities had been wiped out by the force of the wind.

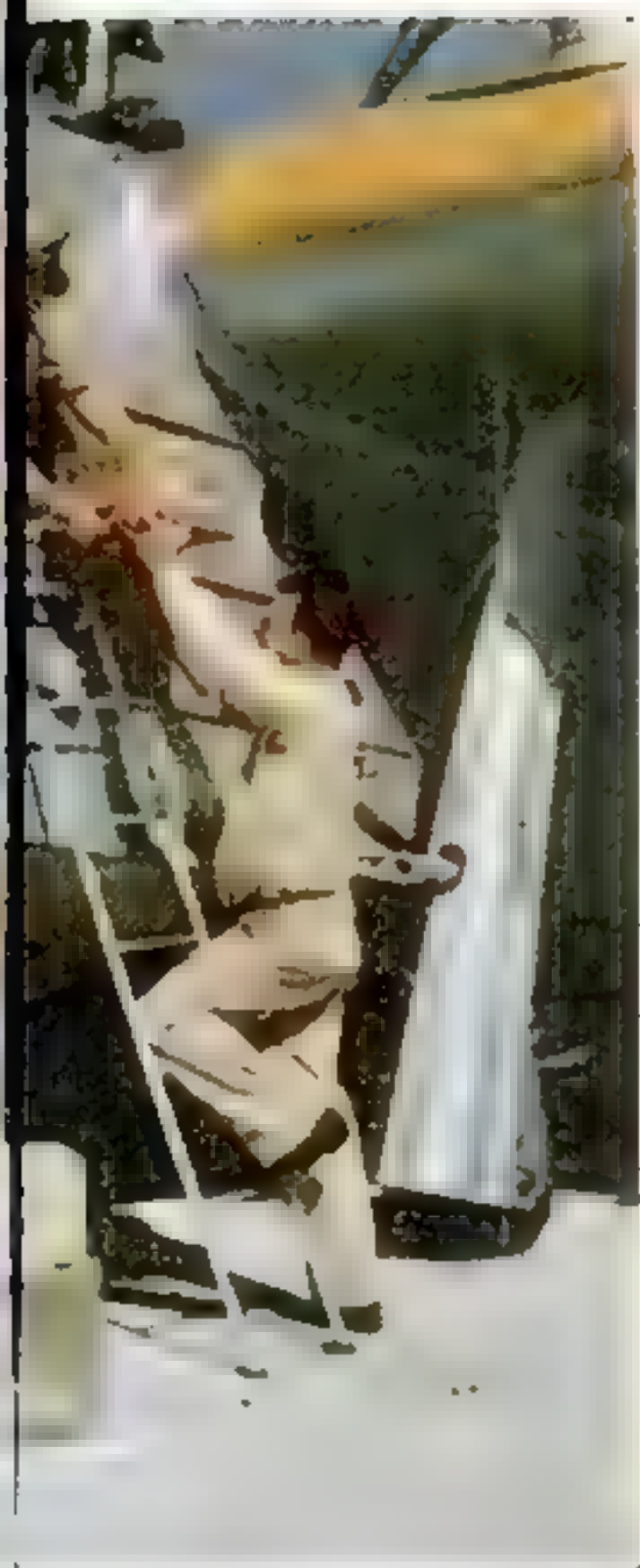
That night, with my assistant, Sid Ross, I headed up the New England coast by car. It was the wildest ride I ever made. Trees were scattered over the highways. Telephone lines were snarled. Bridges were out. Twice,



A state policeman helping survivors. The air view at the right shows the houses of a Connecticut community whirled together in a heap by the big wind







ing loaded aboard a big  
boat of the Coast Guard



Setting up a crude field laboratory, a  
relief worker tests water for drinking



Blocks containing storm warnings. Planes  
drop them on boats that have no radio



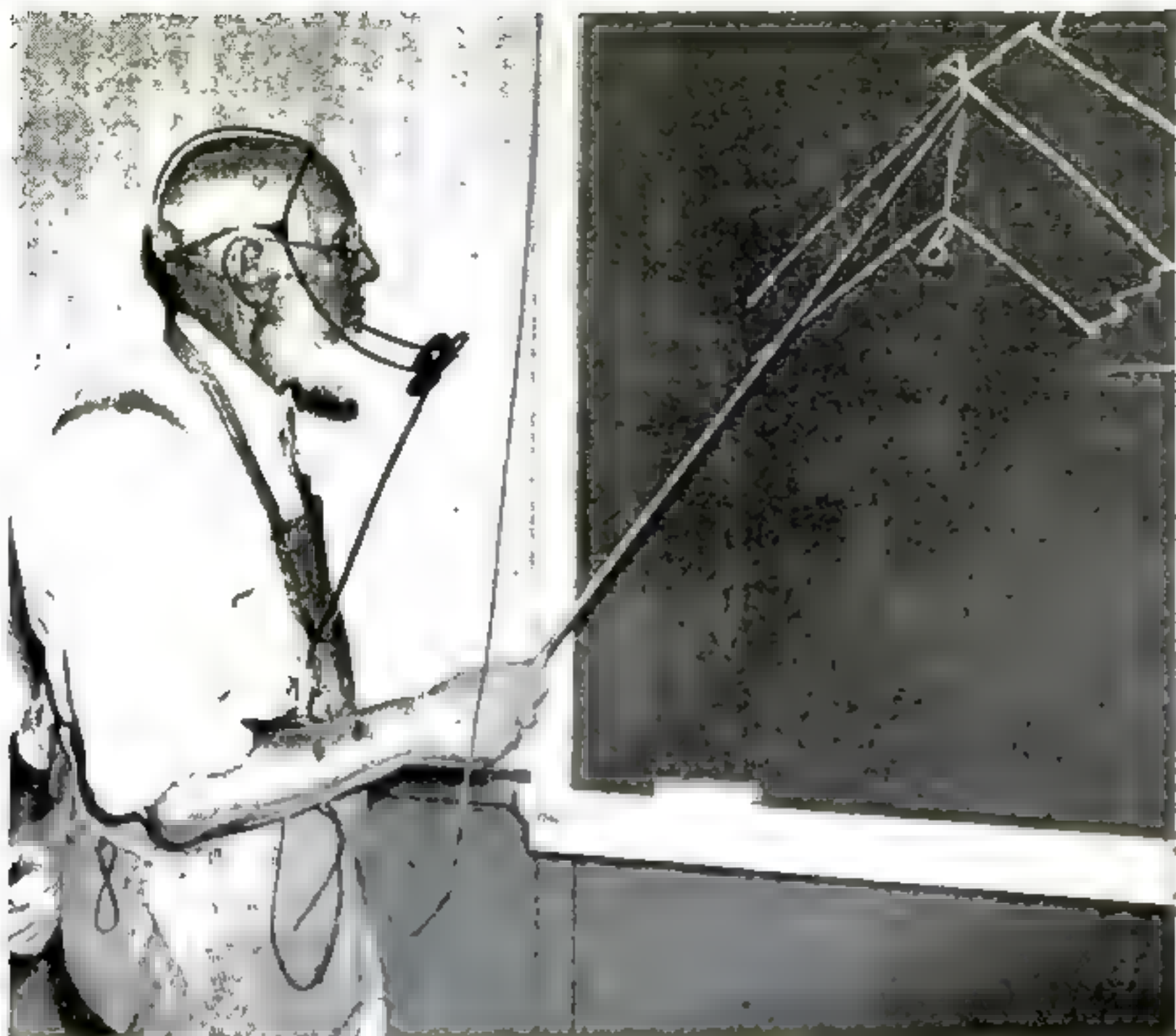
house which had been blown half a mile and had come to rest upside down without a single windowpane broken!

I was shooting pictures at various heights, from 1,200 to 150 feet, and with the Waco traveling between 100 and 120 miles an hour. Fifteen miles from New London, we could see smoke still rising from the fires which had broken out along the waterfront after the hurricane. With the ship cutting back and forth over the ruins, I snapped picture after picture of the wreckage below. Coast Guard boats were plowing through the debris floating in the harbor. At one point, a giant lighthouse tender had been thrown on land and was blocking a railroad track.

The air was boiling. Our ship rocked and pitched. Suddenly, just as I was aiming my Contax camera, the Waco stood on one wing. Its 285-horsepower engine bellowed and we veered in a vertical bank to the left. Just in time, the pilot had looked up and seen another photographic plane slanting down directly overhead. Another minute and we would have crashed in mid-air. That decided us. The air was getting too thickly populated. I had all the aerial shots I needed, so we headed home.

The following day, I went by car and Coast Guard boat to Fire Island. Here, my color camera completed its record of the swift and varied activity which was bringing relief to victims throughout the whole area where winds had run amuck.





## "Mike" Headgear Aids Teacher

TO MAKE himself heard above the noise of lathes and hammers, J. H. Henika, instructor in woodworking at the Georgia School of Technology, in Atlanta, uses an amplifying system and a portable microphone mounted in a novel headgear that supports the mike in front of his lips, no matter which way he turns his head. The connecting wire is attached to an overhead trolley so that the instructor can walk about the shop.

## Transparent Mail Box

ONE glance at a new mail box now available will tell whether the postman has left any letters, for the novel receptacle is made of transparent, tempered glass. Equipped with stainless-steel fittings, the glass mail box will look like new indefinitely, it is said.



Now it's easy to see if there's any mail

## Metal Highway-Lane Barrier Keeps Autos in Line



TO PREVENT head-on automobile collisions on multiple-lane highways, a center-line metal barrier has just been invented. Shaped like an inverted V, the sloping barrier is made of fabricated sheet steel, eighteen inches high and thirty inches wide at the base, capped by a vertical section with rounded, overhanging sides. Recent tests have shown that an automobile crowding into the barrier is automatically turned back by the sloping sides without injury regardless of its speed.

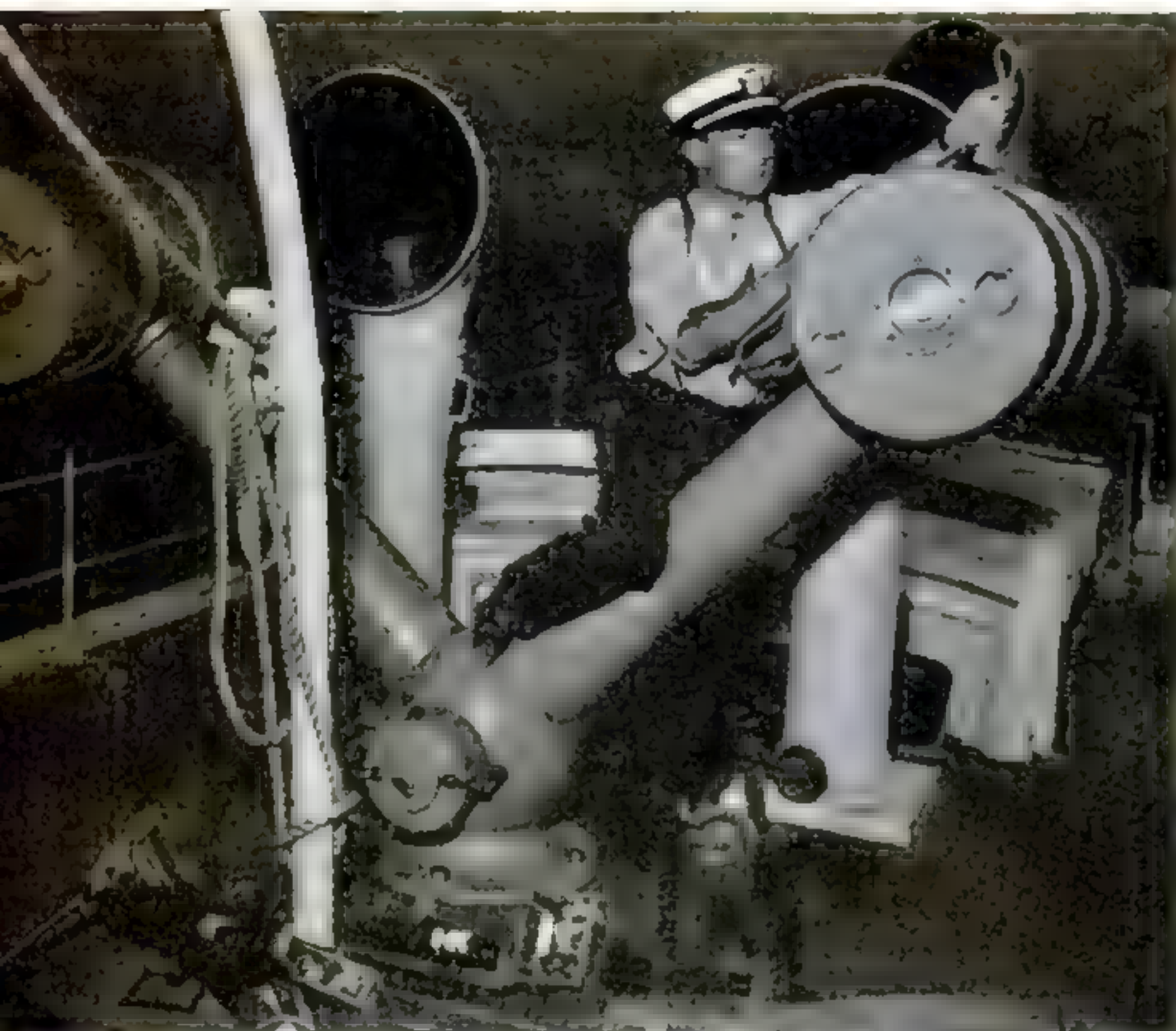
Front and side views of a test car trying to cross the highway-lane barrier. Sloping steel walls force wheels back into line





# Hollywood's Phantom

MOVIE SHIPYARD BUILDS VESSELS THAT NEVER



**L**ASHED by wind and wave, sturdy ships roll and pitch across the screen of your movie theater, or lie at anchor in picturesque ports of make-believe. They are the phantom fleet of Hollywood—mighty barks, speedy submarine chasers, ancient slavers, men-o'-war, sloops, schooners, and brigs. In most cases, they float on shallow tanks, or maneuver on hydraulic jacks or steel balls on studio sound stages and outdoor sets. And the majority of them are creations of a modest Dane named Chris Christensen, who holds a unique position as shipbuilder to the silver screen.

Sixteen years ago Christensen retired from the sea to seek a less adventurous life ashore. He went to California, and one day, after walking eight miles from Los Angeles to a Hollywood studio seeking work, heard a casting director call for a man who could splice rope.

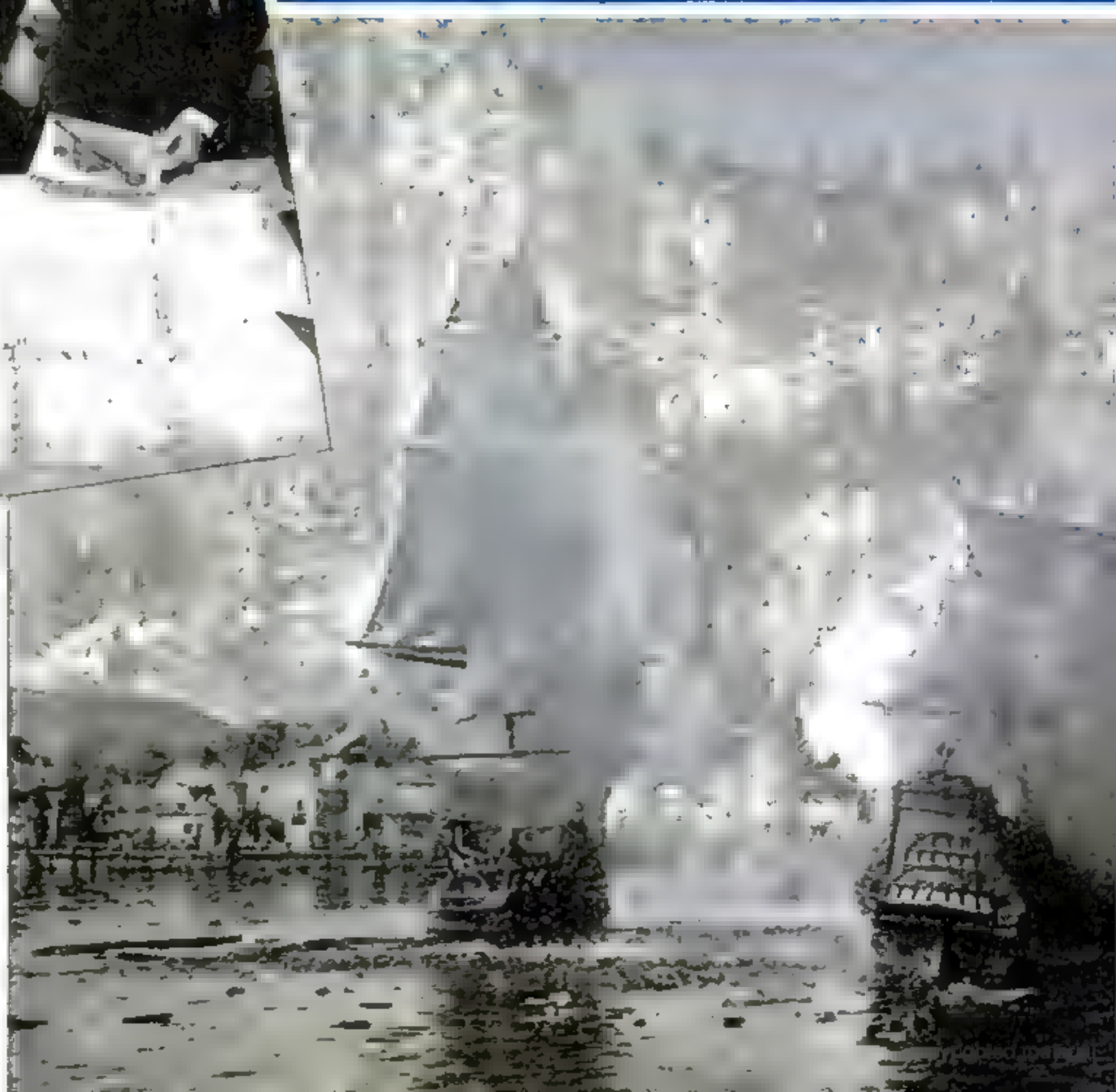
As a youth in his native Aalborg, Denmark, Christensen had learned to perform every task on a sailing vessel from forecastle head to sternpost. He stepped forward and got the call. That simple job launched him on one of Hollywood's

By **ANDREW R. BOONE**



Studio draftsmen laying out plans for a schooner. Above, Christensen with a dummy depth bomb on a sub chaser

At the right is a realistic battle scene between miniature ships, with some of them afire





# Navy

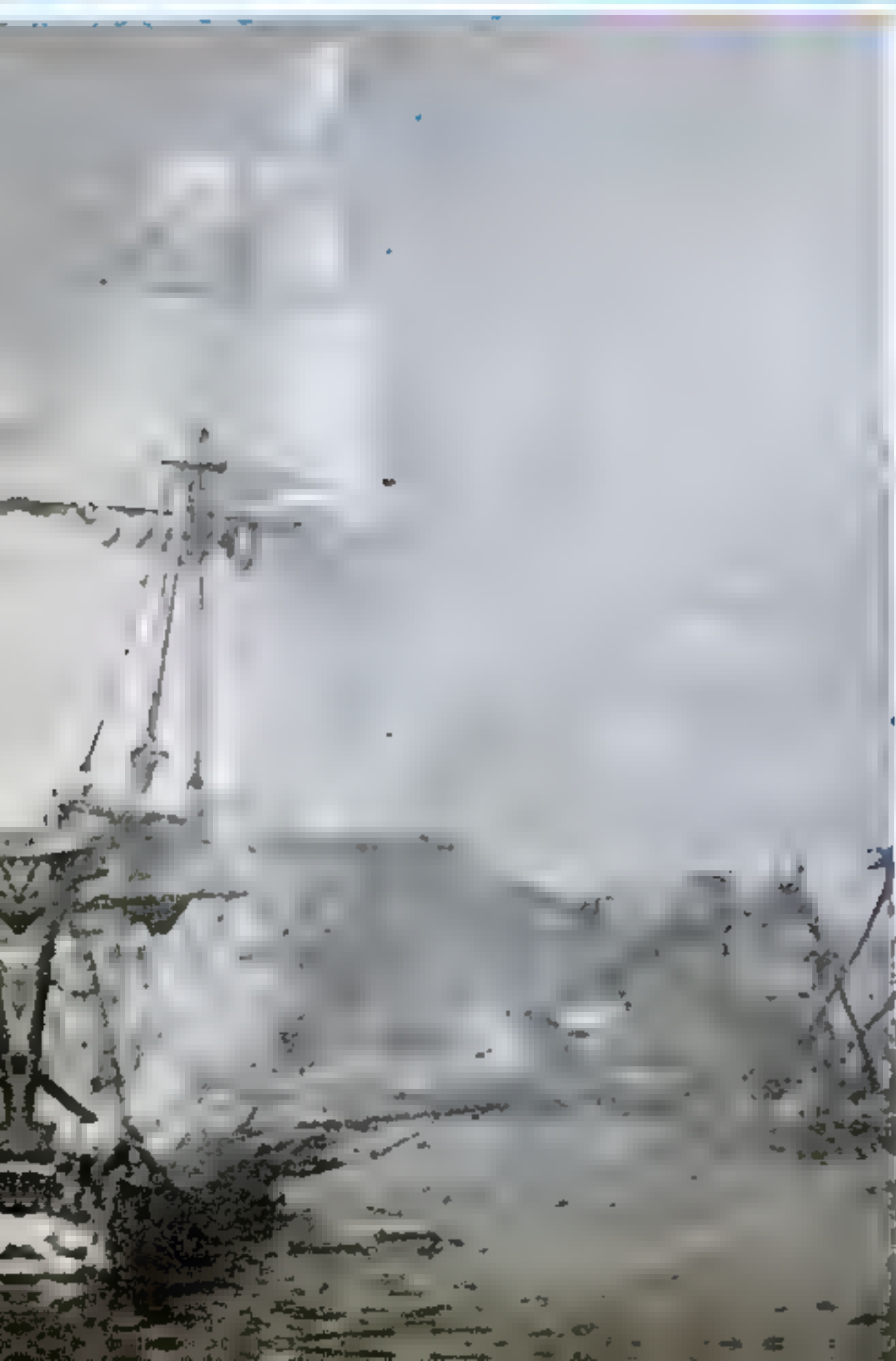
## PUT OUT TO SEA

strangest and most exacting careers.

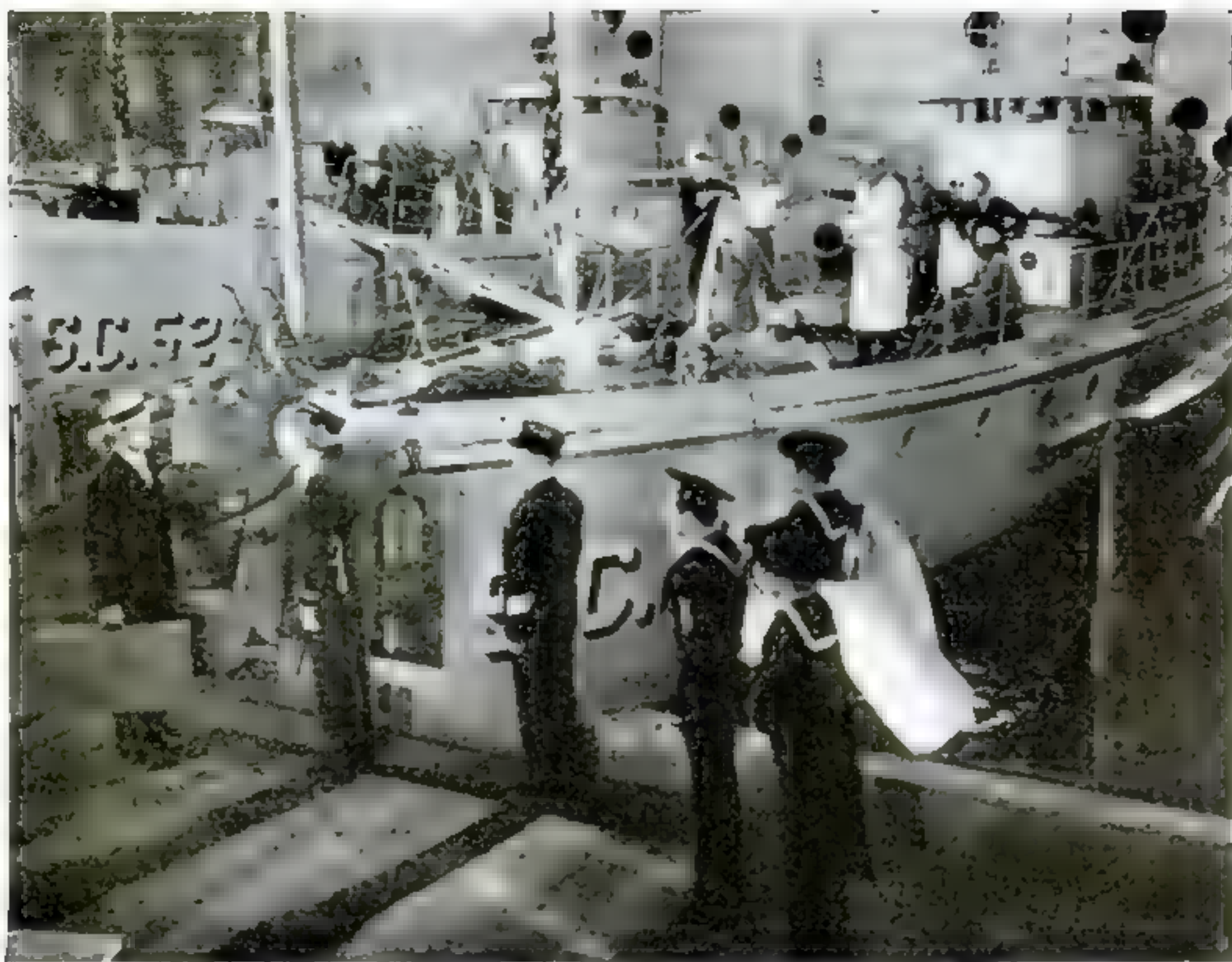
Usually he reproduces old ships for historical pictures, but sometimes he re-creates modern boats in complete detail. He thinks nothing of being awakened at midnight with an order from the studio to have a three-masted bark "ready on stage 10 in eight days." Next morning he lays out the plans, three crews of carpenters start construction, and a week later Christensen has the boat sawed into a half dozen sections or split lengthwise and hauled through the large doors onto the stage where he bolts it together again.

A recent order called for a pair of submarine chasers duplicating those of Uncle Sam's mosquito fleet of World War days. "Complete with three-inch and 'Y' guns," the order read. "And they must float on an even keel."

Christensen visited San Pedro and San Diego, obtained Navy specifications, borrowed guns and mountings, patterned "Y" guns and ash-can depth bombs after those wartime weapons, and laid out a tank thirty-five feet wide by 180 feet long. In the studio







Phantom sub chasers floating in a tank against a background that represents the Brooklyn Navy Yard

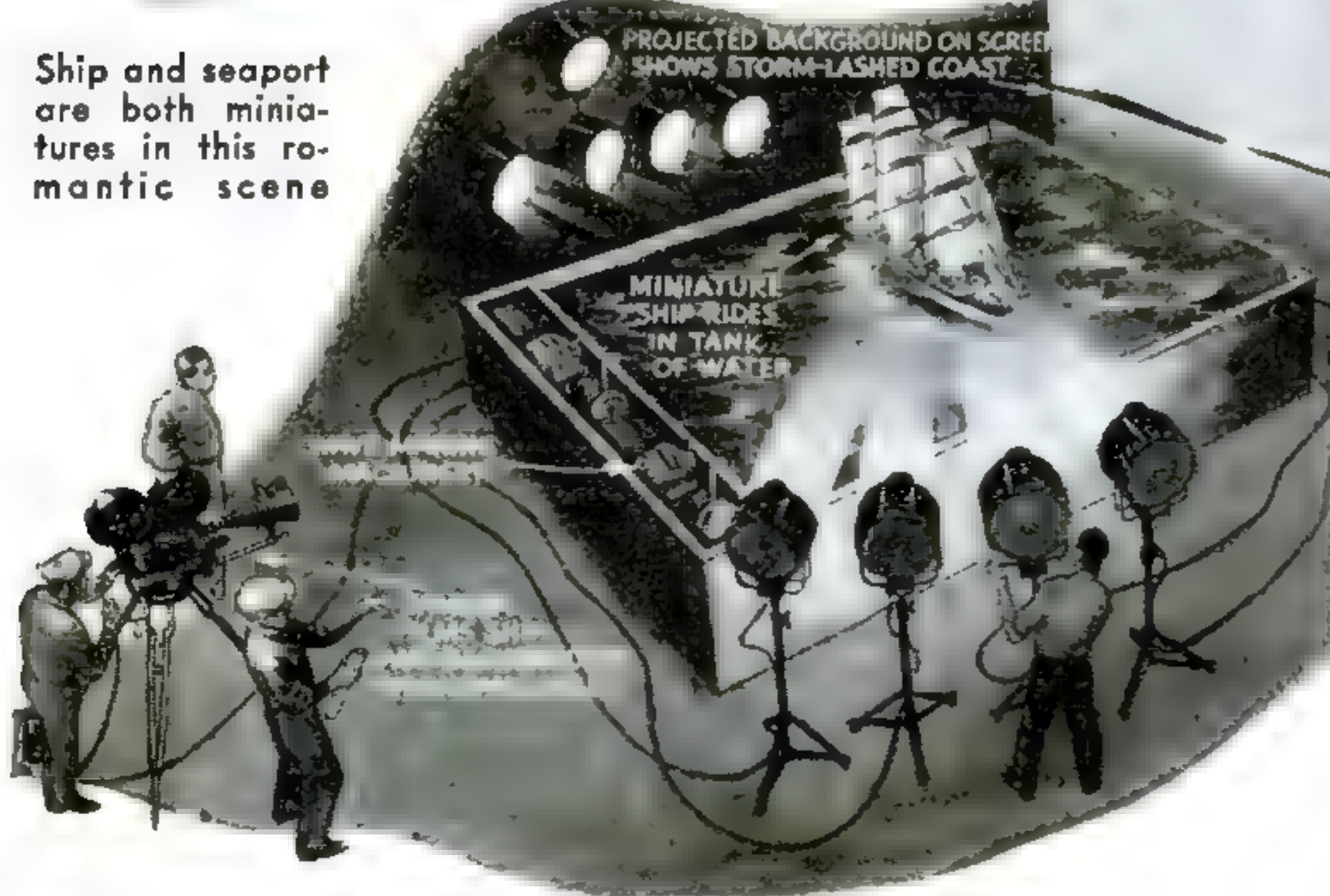
carpenter shop, he directed the building of six pontoons, open at the top. Four days later, a crane lifted the pontoons through the door into the tank. Then a crew of workmen bound the pontoons together, built a hull around them, completed the superstructure, and shortly scenes for "Wooden Anchors" were being filmed, showing the two chasers tied up alongside docks at the Brooklyn Navy Yard.

"Empty, these boats drew only eight and a quarter inches of water, and they were as level as a concrete floor," this master marine technician tells you proudly. "We piled 11,000 pounds of equipment on each, and even when twenty-seven actors crowded one rail, the chaser listed scarcely five degrees."

Using a different method, the builder of boats that never sail recently completed at a cost of \$5,000 a German U-boat in a single piece. From photographs

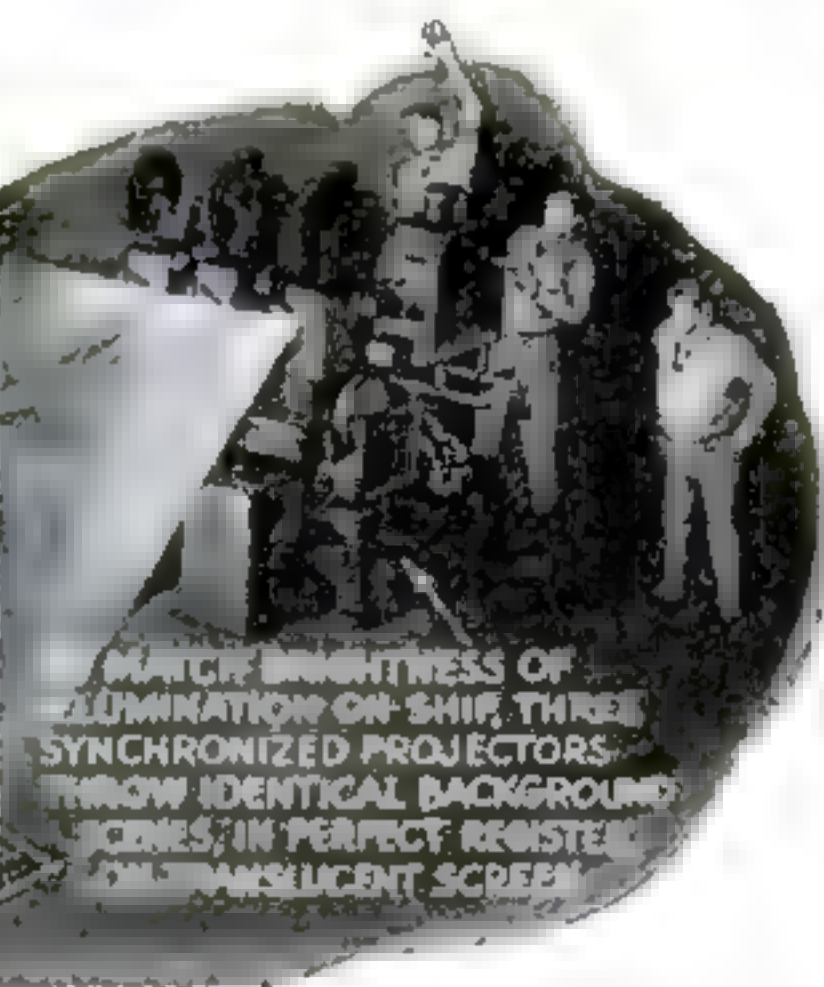


Ship and seaport are both miniatures in this romantic scene



PROJECTED BACKGROUND ON SCREEN SHOWS STORM-LASHED COAST

MINIATURE SHIP RIDES IN TANK OF WATER



MATCH BRIGHTNESS OF ILLUMINATION ON SHIP, THREE SYNCHRONIZED PROJECTORS THROW IDENTICAL BACKGROUND SCENES, IN PERFECT REGISTER ON TRANSLUCENT SCREEN

#### TEMPEST IN A TANK

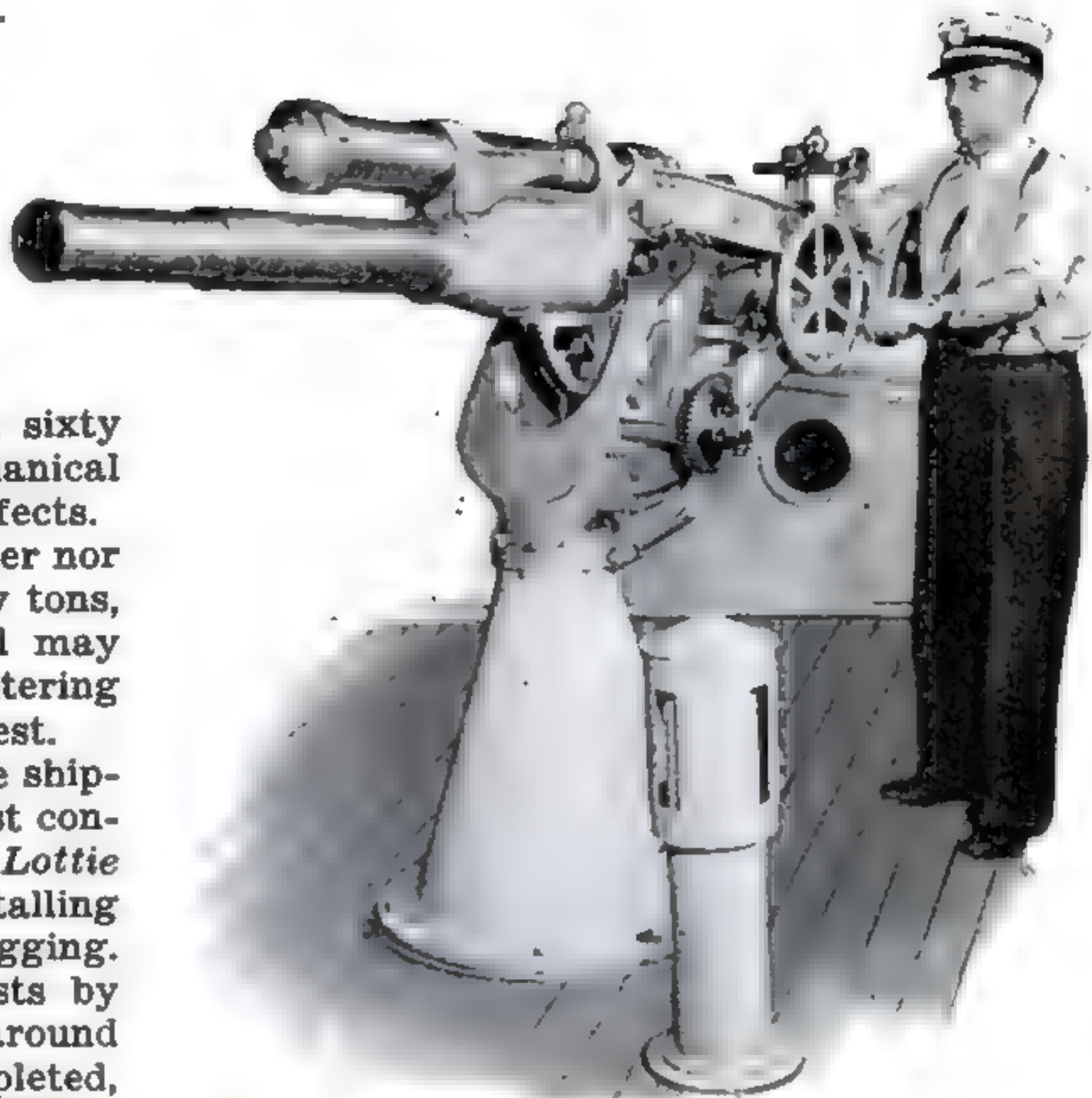
When you see a sailing ship in a storm on the movie screen, don't pity the poor sailors. The scene is probably filmed like this, with a model vessel riding machine-made waves before a translucent screen upon which an ocean scene is thrown



and memory he laid out the long craft, building it in a shallow outdoor pool covering nearly an acre. All wood except guns and hatches, where fidelity of detail and sound required metal, the long, black underwater craft sprang into being in six days. Later, when it sneaked into an enemy cove for supplies in a movie scene, the sub moved along a wooden track a scant sixty feet while wind machines and mechanical agitators supplied waves and storm effects.

Many movie ships neither ride in water nor roll on tracks. Weighing perhaps sixty tons, these pitch and roll and wallow, and may appear to cover thousands of miles, entering ports as far apart as Calcutta and Brest.

Take the slave ship, for instance. The ship-builder undertook a double job here, first converting the twentieth-century schooner *Lottie Carson* into a seagoing slaver by installing fake fighting tops and altering the rigging. He obtained the effect of shorter masts by bolting crosstrees to collars clamped around the masts. When the picture was completed, he restored the ship to her original condition, and once more she sails the seven seas.



Christensen gets his properties from many sources. Here he has a small gun borrowed from the navy



For studio sequences, the slaver's double sat on a platform, acting very much as though a storm would tear her to pieces. Christensen constructed the stage ship in a single piece and bolted her to the platform, which was mounted on a single, large ball resting on a steel plate. From his position at one side, he watched a storm unfold on a process screen and directed four men stationed at hydraulic jacks as they caused the prop vessel to twist and pitch.

Whether the script calls for a cabin cruiser, galleon, schooner, or war vessel, this specialist in ships can turn out the completed job from supplies he has collected during a decade of intensive building. In the studio property rooms are no fewer than twenty-five steering wheels of several sizes; hundreds of miles of rope, ranging in circumference from one quarter to fourteen inches; 500 belaying pins; clamps, cleats, chucks, compasses, engine room telegraphs, navigation instruments; and forty spruce masts, some sixty feet tall.

Cameramen take to the rigging to photograph scenes aboard a ship rebuilt by Christensen to represent a three-masted bark



# Vitamin A Crystals

MAY MAKE YOUR DRIVING SAFER  
BY PREVENTING "NIGHT BLINDNESS"



Photomicrograph showing the vitamin A crystals, recently isolated by Dr. Harry N. Holmes. He is seen at work at the left with his laboratory assistant



By **WALTER E. BURTON**

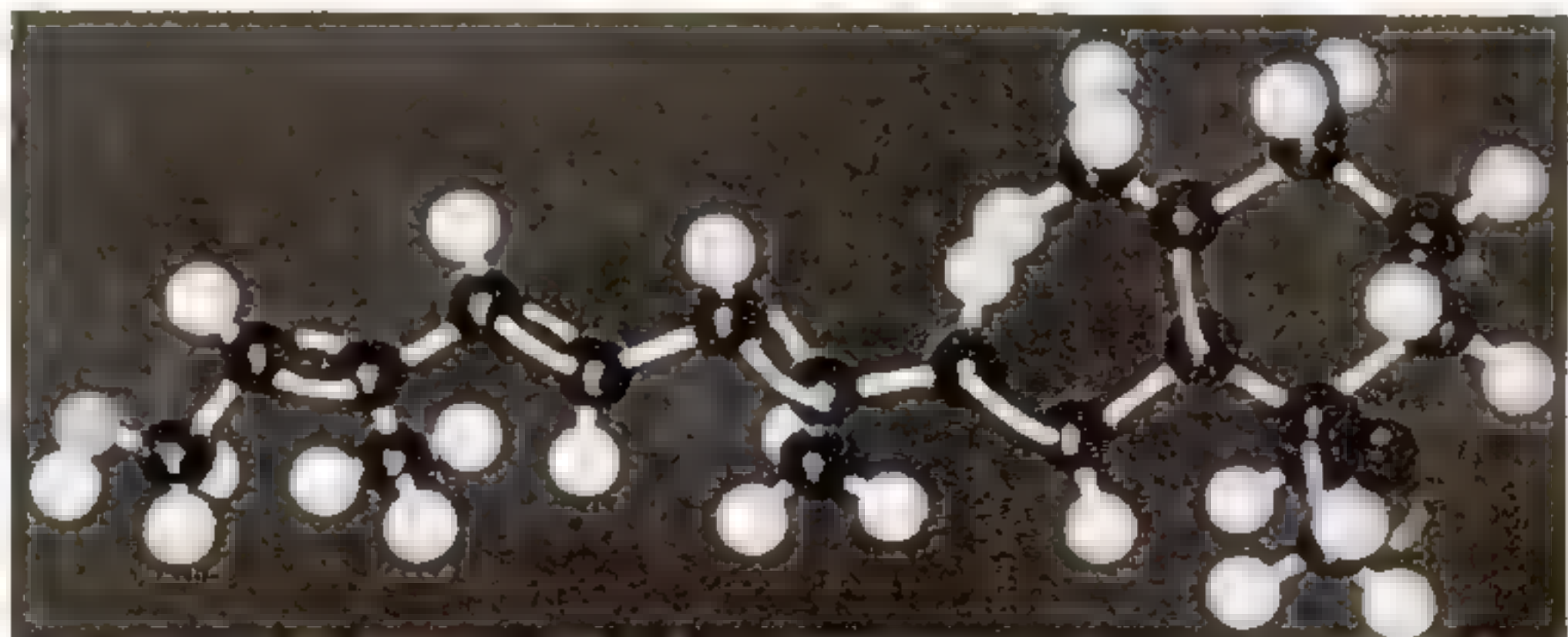
**S**O FUGITIVE that its pale-yellow, needle-shaped crystals must be kept on dry ice to prevent them from melting away, the first vitamin A that anyone has ever seen has just been isolated from fish-liver oil by Dr. Harry N. Holmes of Oberlin College in Ohio. His chemical feat promises surprising practical applications, among them that of making night driving safer.

For years it has been known that tiny amounts of vitamin A, in foods such as egg yolks and spinach, aid growth and increase resistance to germ infection. Recently a curious type of temporary "night blindness" among motorists, which has caused numerous accidents after dark, has been traced to a

lack of vitamin A in the diet.

More knowledge of how vitamin A acts on the body would therefore help to improve our nighttime vision, as well as to promote general health. But research workers until now have been handicapped by the necessity of making tests with impure concentrates of the vitamin. Dr. Holmes's new process provides the pure crystals needed to make their experiments more reliable.

The isolation of vitamin A already has made it possible to find what that vitamin is made of. As illustrated by a model using different-colored spheres that Dr. Holmes exhibits, it turns out that a molecule of the strange substance consists of carbon, hydrogen, and oxygen atoms, in a proportion expressed by the chemical formula  $C_{30}H_{50}O$ .



Model of the vitamin A molecule. Black balls represent carbon atoms, white balls the hydrogen atoms, and single gray ball the oxygen atom





Directional loop antenna of the new automatic blind-flying aid. Right, instrument dial in cockpit. Needle always points to the station tuned

## Direction Finder Is Automatic

AN AUTOMATIC direction finder for aircraft, recently announced after months of intensive flight tests, is a new aviation safeguard for blind flying. Actuated by a radio receiver employing a directional loop antenna, the new finder, unlike older models, does not require continual adjustment. An indicator needle on a dial mounted horizontally in the plane cockpit points continuously in the exact direction of the transmitting station to which the instrument has been tuned. The direction finder is expected to be of value in supplementing radio-beam apparatus.



## Giraffes Make Trip in "Rubberneck" Truck

TO TRANSPORT two giraffes, recently imported from Africa, from the eastern seaboard to their new home in the San Diego, Calif., zoo, the odd rubberneck truck body shown at the left was specially constructed. It took keepers two days to lure the giraffes into the odd vehicle before they could start on their cross-country jaunt.

Two giraffes ready for their transcontinental trip in a truck. It took two days to lure them in



## Inexpensive Hand Loom Speeds Up Knitting



**M**ORE than doubling the speed with which garments can be knitted by means of conventional needles, a hand loom recently invented is said to require but little practice for efficient operation. Three and a half inches wide and thirty-two inches long, the loom consists of two sections which can be spread apart by means of slotted metal plates that are locked with thumb screws. Yarn is looped back and forth along numbered pegs on each half of the loom, and then a pick resembling a crochet hook is employed to lift the yarn loops over the various pegs as the knitting process progresses. A counting device keeps track of the rows knitted. A detailed view of the pick loom is shown in the inset above.



## Automatic Rifle Has Odd Design

**BULLETS** are fed into a new rapid-fire automatic rifle, issued to German infantrymen, from a circular cartridge chamber that juts out from one side of the gun barrel, as pictured in the photograph above. Packed in spiral fashion within the metal cartridge chamber, the bullets move automatically into place in the gun breech when the trigger is pressed, thus making the rifle serve as a lightweight machine gun that can be carried by advancing infantry like an ordinary rifle.

## Census at Big Dam Gives Check on Spawning Fish

**TO DETERMINE** whether the Bonneville Dam on the Columbia River in Oregon is cutting down the number of salmon that swim upstream to spawn in the headwaters of the river, U. S. Government agents are now conducting a salmon census. Seated on a platform overlooking gateways in the dam, observers constantly count the salmon as they swim through, outlined above square white boards.



Fish swimming over the white flashboard are easily spotted by the census taker



# Oyster Boat Is Giant Vacuum Sweeper

**H**ARVESTING oysters by sucking them up from the oyster beds, a floating vacuum sweeper has just been put into commission on Long Island Sound. While the dredge *Seawanhaka* is cruising at three knots, workmen lower over the sides two suction heads, ten feet wide and shaped like those used on conventional household vacuum cleaners. As these roll over the oyster beds on huge airplane-type tires, vacuum pumps draw the shellfish up to the deck through flexible pipe lines. There, the oysters are discharged onto screens, washed, and then dumped onto con-

veyor belts that carry them to storage bins. By providing a continuous loading operation, the vessel is able to harvest many times as much as older and smaller craft that drag chain-mesh bags over the beds. Details of the curious oyster harvester are pictured in the photographs on this page.

Like vacuum-cleaner suction heads, two of these wheeled units sweep the bottom of the sea to gather oysters



How the oyster dredge "Seawanhaka" drags her sweepers on sea floor



On her top deck, the "Seawanhaka" carries this elaborate machinery. Oysters drawn up to it are first washed, then dumped on conveyors shown in background, which carry them to storage bins in the hold



# AMAZING Stop-Action Photographs

## MADE BY STUDENT ENGINEER



At top, Frank Wyle preparing to photograph a drop hammer in action to detect flaws in its design. His "flash gun" produces 5,000,000 candlepower for 1/50,000 of a second. Above, placing microphone to set off a flash

**S**OMETHING had gone wrong on the big drop hammer. Each time it descended against a sheet of duralumin being formed into an air scoop for an airplane, part of the metal tore away. What was causing it to rip apart? When were the uneven stresses first set up? And why?

Frank S. Wyle, young student engineer whose hobby of taking fast stop-action pictures had carried him into the factory, sought the answer.

Carefully he set up an ordinary camera, placed a carbon microphone directly against the drop-hammer machine, and connected his complex flash outfit to the microphone.

"O. K.," he called to the machine oper-



ator, after opening the camera's shutter. "Let her drop."

Down came the hammer, and as it smashed against the duralumin sheet, the sound leaped into the mike, was converted into an electric impulse sufficient to actuate a delicate device which in turn "fired" a tube filled with the rare krypton gas. A 5,000,000-candlepower flash lasting only 1/50,000 of a second "stopped" the hammer dead in its tracks. Thirty-six times that day, young Wyle took instantaneous pictures showing the hammer at various levels as it crashed down on sheets of metal. Later he studied them, recommended that the rubber pads used to distribute the strains be rearranged, and thereafter the drop hammer performed its herculean task with seldom a marred job to its discredit.

Stop-action pictures taken at speeds many times faster than any camera shutter can operate, and actuated by the sound of the ailing machines themselves, are the newest aid of science in solving technical problems in industrial plants. Only a few months ago, Wyle set out to find a practical application for the new form of photography which stops high-speed motion that the human eye cannot see, and puts it into photographic black and white for engineering analysis.

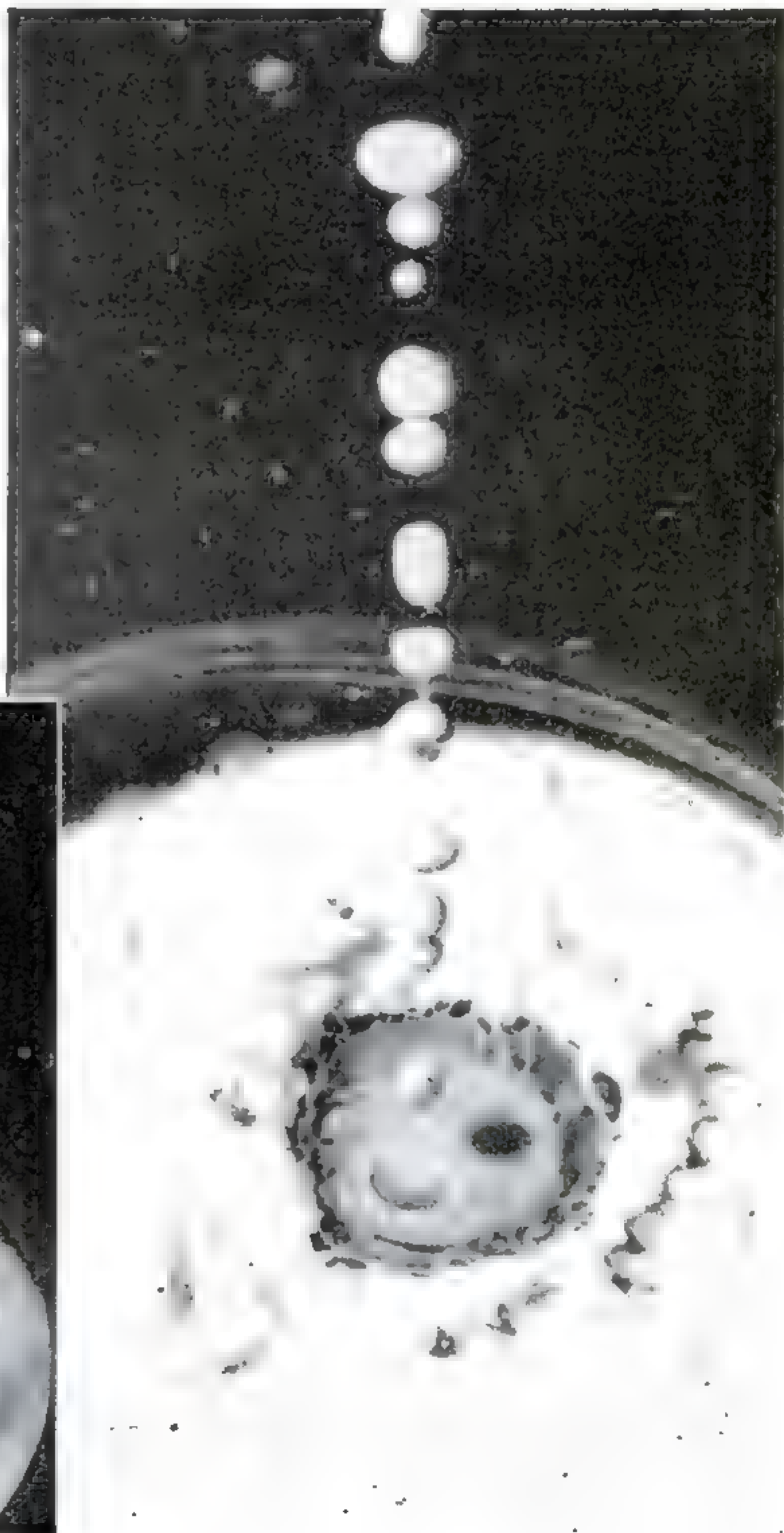
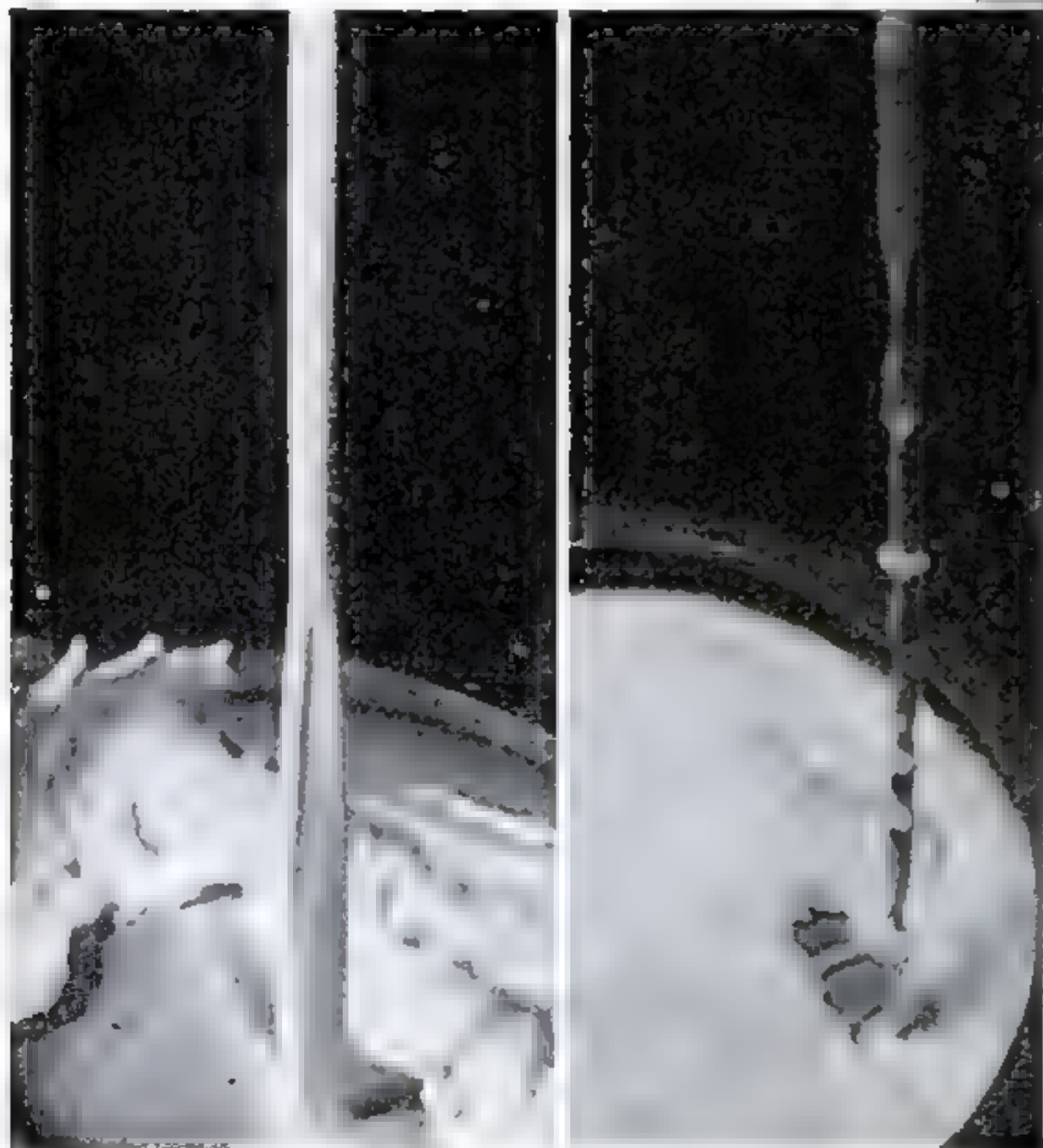
Wyle entered the Massachusetts In-

stitute of Technology in Cambridge last year, as a freshman in the mechanical-engineering department. There he consulted Prof. Harold E. Edgerton, who had invented a flash system for stop-motion photography. Working from Edgerton's plans, Wyle built his own outfit. Nameless, the apparatus takes 110-volt alternating current, steps it up to 3,000 volts, converts this alternating into direct current, and uses it to charge a bank of condensers. These discharge through a tube filled with krypton, at the same instant the high voltage is put through a spark coil into a wire wound around the tube. When the electrical charge passes through the glass into the ionized gas, the tremendous flash is

By GROVER C. MUELLER

#### POURED MILK LOOKS LIKE THIS

The stop-action camera shows a heavy stream to be smooth, below left. A thinner stream takes on a bumpy appearance as drops form. Right, a fine stream breaks into oval drops





## TWO DOWN, ONE TO GO,

and the bullet can be seen on its way at right to shatter the third of three Christmas-tree bulbs as the brilliant flash illuminates it. Below, Wyle sets electric contacts that control the flash mechanism

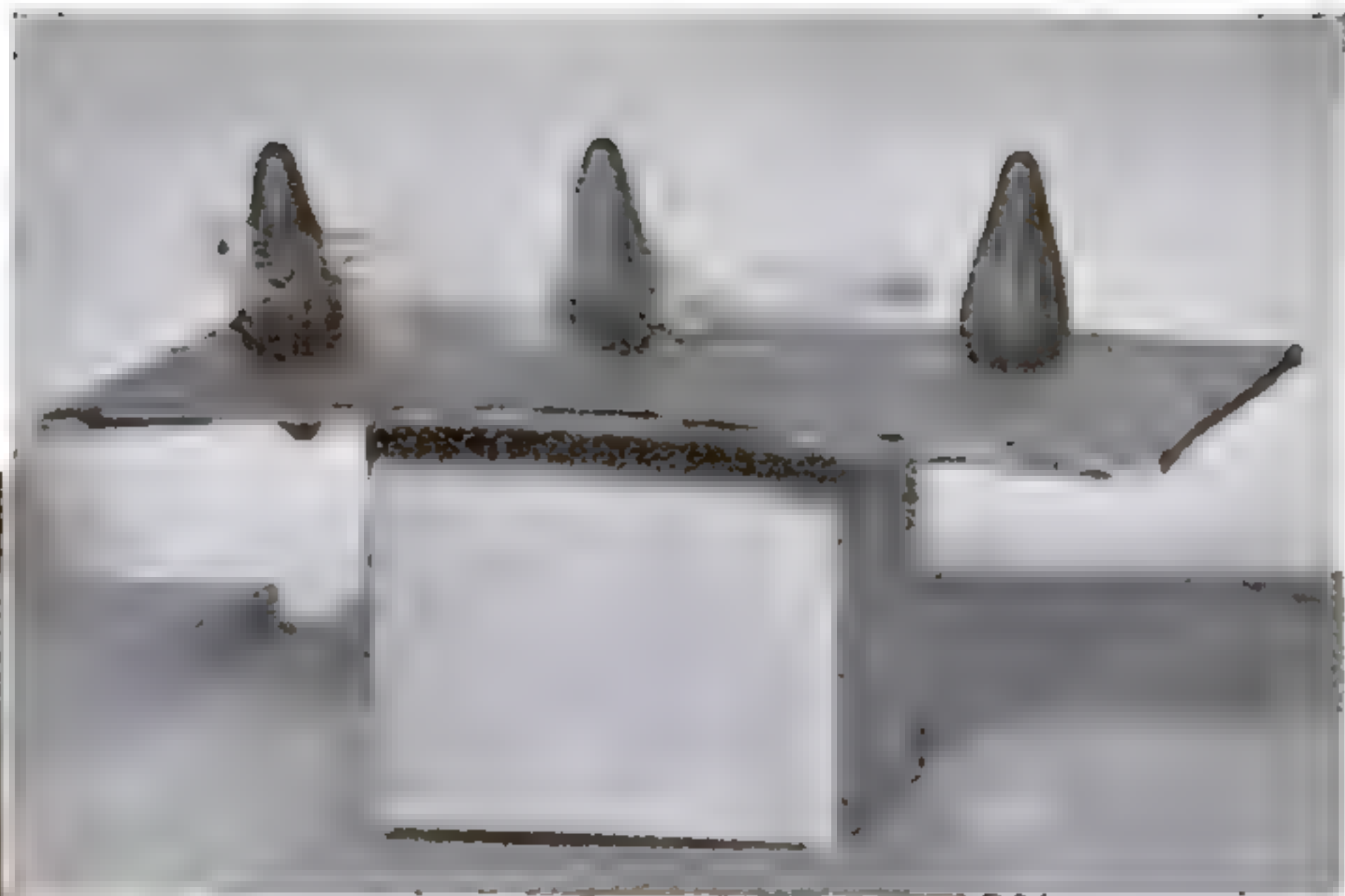


set off to make the fact-finding photograph.

Not content to fire the action-stopping flash mechanically, Wyle started last spring to find ways to make his mechanical subjects direct the taking of their own pictures. Experimenting in the laboratory with photoelectric cells, special electrical contacts, and sensitive carbon microphones, he was successful in devising various systems for making his high-speed camera "stop" fast-moving objects so that careful studies under actual working conditions could be made of such things as airplane propellers, shop equipment, and complicated industrial machines.

Wyle started his picture-taking experiments at home during vacation. He photographed milk falling into a pan, pictured a .22 caliber bullet mowing down three light bulbs set in a line, halted water tumbling from faucet into glass, and showed a light bulb actually bending before breaking under the impact of a hammer.

"Water, when stopped, strangely resembles beer," he told me, "and milk assumes forms quite different from their supposed patterns. Instead of falling as teardrops with trailing



tails, they take, because of surface tension, the shape of eggs."

"How," I inquired, "are such pictures made?"

"It's comparatively simple," Wyle explained. "Open the camera in the dark and set off the flash. Close the camera and turn on the lights. The aperture may vary from F/2 to F/6.3, depending upon the distance to the object."

Wyle graduated quickly from photographing liquids, and began experimenting with really fast things. Bullets, for instance. He found he could take

pictures of bullets either by having them strike a small strip of metal, closing a contact just before entering an objective, or by setting up a carbon microphone at a proper distance from the gun. In the accompanying picture of the three small light bulbs, he placed the contact six inches in advance of the first bulb, and caught the bullet 1/10,000 of a second later, between the second and third bulbs.

**SOUND-ACTUATED** pictures promise much for industrial purposes. Here the picture is snapped when the carbon mike transmits a voltage which is amplified to 400 times the input, to set off the flash. For delayed flashes, the mike is moved farther away from the source, to take advantage of the time required for sound to reach the microphone. Early in his sound experiments, the young photographer set up his apparatus in the garage of his home, and first placed the mike near a gun. The picture was snapped before the bullet left the barrel. Again, he tried placing the microphone out of doors. The results showed improvement. Recently, he installed a microphone on a plate

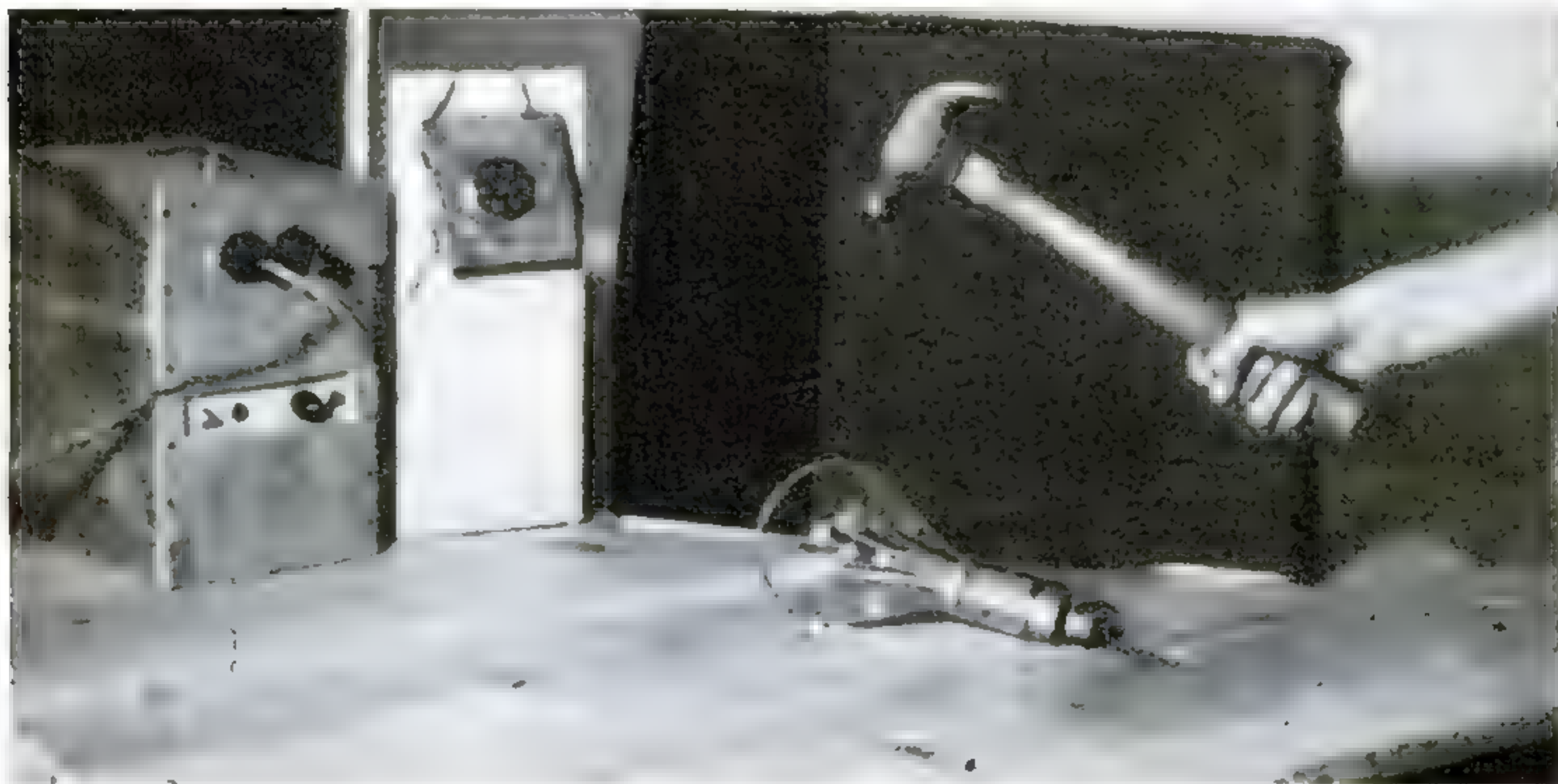
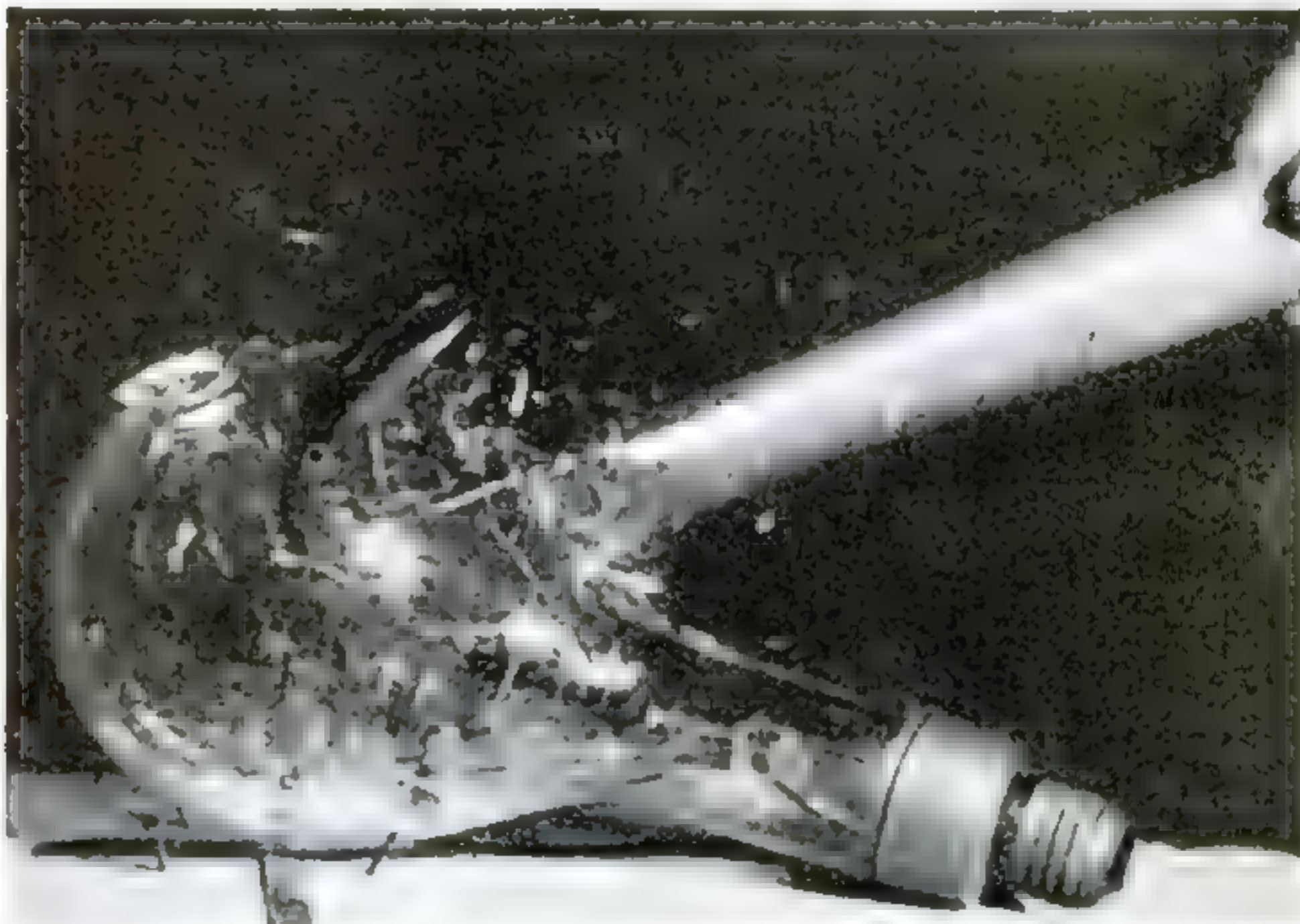
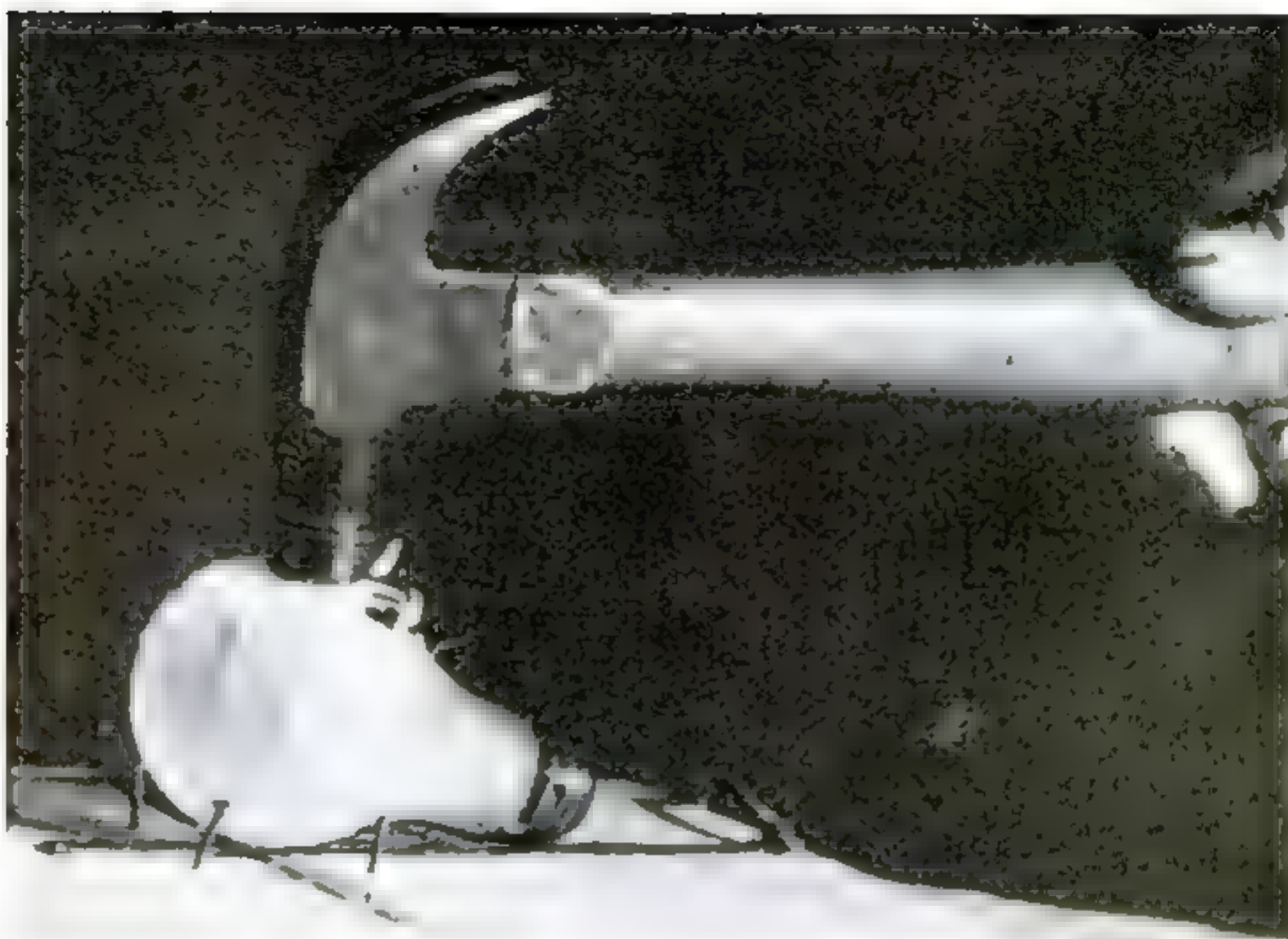


of tin, through which he plans to fire bullets, thus controlling their position for pictures with almost mathematical certainty. Wyle has even stopped with his camera the tip of an airplane propeller whirling at 600 miles an hour.

Speed pictures reveal many secrets of importance to manufacturers. How far will glass bend before breaking? Light bulbs resting lightly on four nails immediately above two crossed metal strips reveal heretofore-unmeasured resilience before shattering under the blow of a hammer. Why do some engines operate smoothly at a given speed, yet shiver and shake when turning at the same speed under a load? What is happening inside the machines responsible for industry's many products? How may their efficiency be increased? From the vacation hobby of a college boy may come the answers to many such questions.

#### SEEING GLASS BEND BEFORE IT SHATTERS

In the split-second photograph at the top, right, the glass bulb is bending under the blow of the hammer before shattering. Note the microphone in set-up below





# Foiling the

**N**OT long ago, a young mining engineer telephoned the office of Dr. John Herman, Los Angeles assayer, for reports on some gold-ore samples he had left.

"I'll read them to you," answered Dr. Herman. "Sample No. 1, \$187 to the ton in gold; No. 2, \$201; No. 3,—"

"Hold on," interrupted the engineer. "Something's wrong; those can't be my samples."

"They're what you brought in this morning," insisted Dr. Herman. "You'd better come over and we'll straighten this out."

When the two bent their heads over the report, the engineer grinned. "My client is just about to buy a mine," he explained, "but he wants my opinion before he pays any money. The fellows who own this claim are too smart to sell anything with ore this rich. I smell a rat!"

Together they went back into the laboratory and looked at

By  
**ROBERT E. MARTIN**



## GUARDING SAMPLES BEFORE ASSAYING

Bags of ore samples to be assayed are sealed and guarded carefully to prevent tampering. A common dodge of the mine salters is to jab a hypodermic needle into a sample bag and inject a solution of gold or silver, as illustrated at the right





# Gold-Mine Swindlers

the "cuttings" of the original samples, the small quantity usually retained for check-up.

"Let's pan it and see what it looks like," proposed Assayer Harry Newitt, of the laboratory staff.

He got out a gold pan, dumped the sandlike material into the water, and rocked it back and forth. Soon little yellow glints appeared among the heavy sediment. Newitt gathered a tiny pinch and put it on a microscope slide.

"Look!" he exclaimed.

Through the eyepiece the engineer could see round, bead-like droplets of gold. Each was slightly flattened, as if dropped while molten. They looked fragile and some of them had shattered like eggshells.

"This stuff never came from the ground," grunted the engineer. "What d'you suppose it can be?"

"Let's spectro some of it and find out," suggested Dr. Herman.

A tiny pinch of the material, put into the cupped crater of the spectrographic arc, left a strong pattern of vertical bars upon the recording film. A little later, as the two stood



Photographing an ore sample under ultra-violet light to study metal particles

in a projection room and looked at the image thrown upon the screen beside a master film showing all the metallic elements, the mystery was clarified.

"Gold telluride—no wonder that sample assayed high!" laughed Dr. Herman. "Some-

## WILES OF THE MINE SALTERS

Gold dust mixed with clay and stuck under the finger nails makes ore "pan" well for a sucker. Another trick of the swindlers is to roll a little of the dust into a cigarette and allow the ashes to drop into the pan in which the sample is being washed







A veteran prospector reading his assay report in the office of Dr. John Herman

body's got hold of some roasted telluride-ore samples from a specimen cabinet and put them into the sample bags. That's just a little bit too good—it's like going fishing and catching a herring already kippered!"

Detectives of the gold fields are using new laboratory magic to expose mine "salters," those crafty promoters who load samples with gold to deceive unwary purchasers of claims. With camera, black light, and spectrograph, the assayer today may actually read clues in the tiny individual grains of gold. Minute scratches may show that they were filed off a watch case, or chemical tests reveal the presence of alloys used in dental gold. In the old days, the tricks of mine salting were practiced so extensively that they became well known, but since then a new crop of "suckers" has grown up. Today the old dodges are being extensively revived—but new scientific methods make it harder than ever to fool the expert. For, like other criminals, the mine salter usually leaves a telltale trail behind him.

A favorite scheme for salting is to load shotgun shells with gold and fire them against the face of a drift. The gold plasters itself against the rock realistically enough to fool most prospectors. But the microscope shows clearly how the droplets have splattered like raindrops on a windowpane, and the difference

of gravel in the presence of a possible victim.

Still another easy scheme is to dissolve the gold in aqua regia, a mixture of nitric and hydrochloric acids, and then squirt the solution over the rocks. Some of these are porous enough to soak it up, blotterlike. Many a novice, no matter how careful he was in tying up his canvas sample bags and protecting them with seals, has been fooled by a salter who jabbed a hypodermic needle through the canvas and added enough gold or silver-bearing solution to make the samples show bonanza values. Shovel handles have been bored and loaded with dust so it would dump out when the handle was turned the right way. Then there's the scheme of getting a sucker to take a sample out of each bucket that comes up from the mine—with a confederate below putting a few choice pieces of ore on top where they'll be handy. These methods still are in use today, but the modern assayer has new tricks in his bag.

"You might think that gold dust always looks the same," says Harry Newitt. "Well, it does, to the naked eye; but under a compound microscope there are noticeable differences. For example, not all gold is yellow. Some looks red, some white. On the beach at Nome, Alaska, it is nearly black.

"Placer, or stream-bed, gold has been well

from natural gold is unmistakable.

"Salting the pan" is a more economical method—it doesn't take so much gold. Only 200 milligrams, rolled into a cigarette whose ashes are allowed to drop into the water while you are panning, will make a richshowing. Oneman appeared nervous while bending over to watch his prospect pan out a trial sample, but there was good reason why he kept running his hands through his hair—it was literally loaded with gold dust. Another mixed a little gold with clay and stuffed it under his finger nails—ten tiny samples that easily washed out as he panned trial batches

**THERE ARE MANY CLEVER WAYS OF "SALTING" A CLAIM BUT METALLURGICAL DETECTIVES CAN SPOT THEM ALL**



sorted by nature, for running water has carried the smallest pieces farthest, dropping the heavier ones near the source. If panfuls from a given claim show several types of grains, it may indicate overlapping deposits drifted down from several 'mother' lodes upstream—or it may mean a salted claim.

"Occasionally we have detected sharp grains of hard-rock quartz among samples from stream-bed, placer claims, or rounded, water-worn particles and even small nuggets in samples supposedly blasted from a hard-rock mine. When such a thing occurs, we know at once that the claim has been salted."

In half a dozen samples of ore from as many mines, you'll find that each piece has a different structure. In quartz, gold occurs in long narrow strings, in flat scales, tiny plates, or chunky masses. Sometimes it looks like clusters of crystals, whose pattern or grouping is a telltale characteristic. An assayer who suspects crooked work puts the specimen under a binocular, stereoscopic microscope. Like the old-fashioned parlor stereoscope, this instrument gives a three-dimensional view. Under oblique lighting, structural details stand out in strong relief.

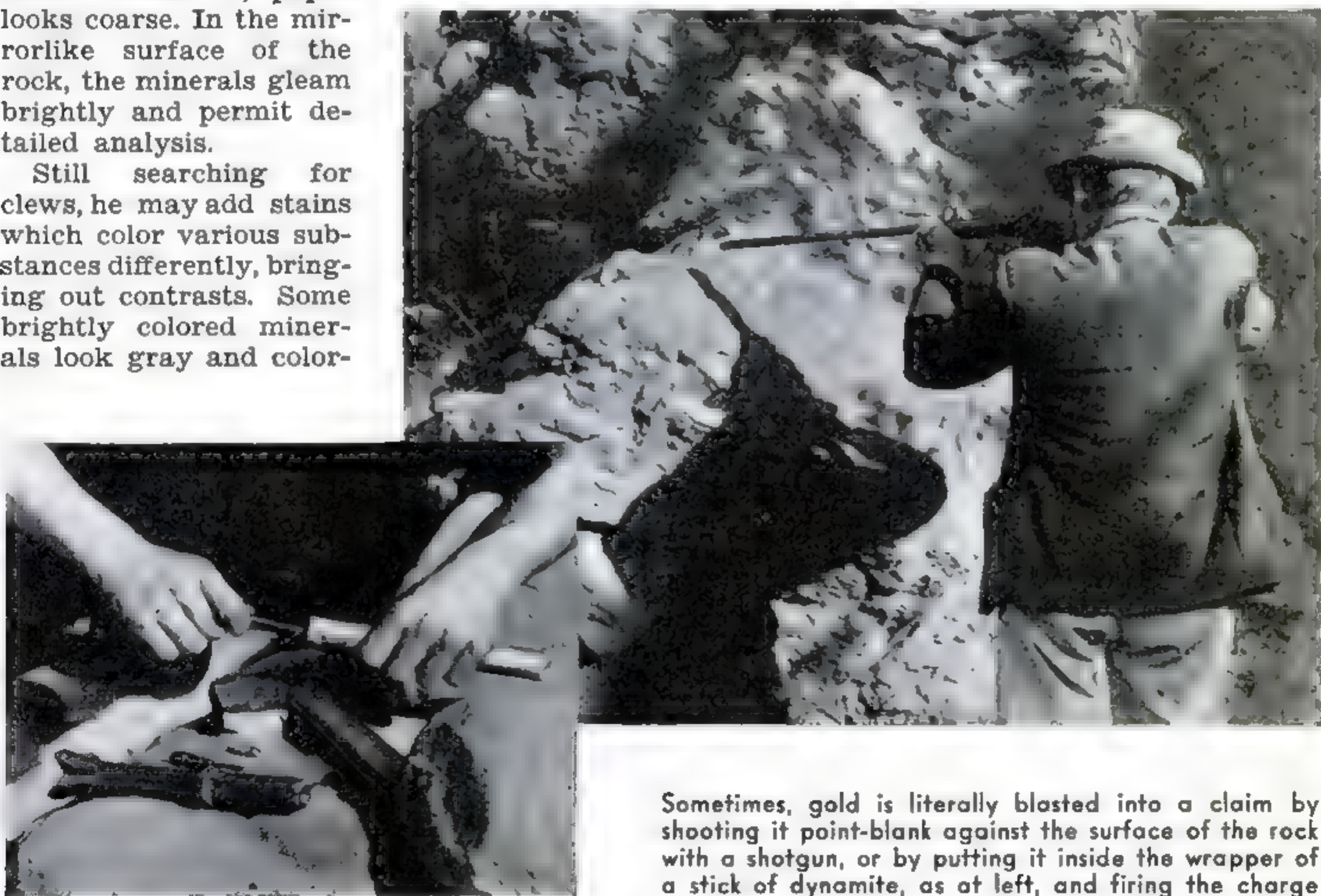
For a better view, the assayer may prepare the specimen by slicing off one face of the rock with a lapidary's saw, gluing it to a chunk of sealing wax, then sawing off the other face and polishing it down until there remains only a wafer of rock about one two-thousandth of an inch thick. Beside it, paper looks coarse. In the mirrorlike surface of the rock, the minerals gleam brightly and permit detailed analysis.

Still searching for clues, he may add stains which color various substances differently, bringing out contrasts. Some brightly colored minerals look gray and color-



Hundreds of small pans in the assayer's laboratory hold samples of assayed ore for future check-ups

less under perpendicular reflected light. Or, using special prisms, he can examine a specimen with two beams of light of different velocity, thus determining the refractive index. He may even photograph the sample under ultra-violet light, then run a small calibrated wheel around the splotches of mineral to measure their area and get the typical size of the gold particles. Often this method is used to determine whether an ore can be milled efficiently, or whether the cyanide or



Sometimes, gold is literally blasted into a claim by shooting it point-blank against the surface of the rock with a shotgun, or by putting it inside the wrapper of a stick of dynamite, as at left, and firing the charge



flotation process should be applied instead.

If the sample consists of gold dust, he may mix it with a plastic material and vulcanize it into an artificial rock, to be examined under the petrographic microscope with polarized light. He may count the particles in a known weight of sample, estimate their size, note their shape, and look for telltale signs of adulteration. And if these methods fail to reveal fraud, chemical and spectrographic tests may yield a clew.

Natural gold varies considerably in purity. Alaskan gold, for instance, runs about 900 fine (900 parts gold in each 1,000); but in some regions the fineness drops as low as 500. In places it is found as "electrum," a natural alloy half gold, half silver. The purest gold ever discovered ran 99.7 to 99.8 percent pure, the minute remainder consisting of copper, a little iron, and an infinitesimal trace of silver. Even such small impurities would register clearly on the spectrograph, and any gold that didn't conform to this "recipe" could easily be detected.

One day, a promoter walked into

Dr. Herman's Los Angeles assay laboratory with a sucker in tow, proudly bringing a sample for test. When the pair returned and opened the report, the first man snorted indignantly.

"Dollar and a half to the ton! Why, man, you're crazy. That mine's a bonanza. What kind of an assay do you call this?"

The assayer smiled. "If you're not satisfied, we'll run it again for you."

The two left in a huff, but soon the promoter returned—alone. "Say," he asked confidentially, "what's the matter with you fellows? That sample had plenty of gold in it. I know—because I put it in!"

"Where did you get the gold?"

"At the dime-store jewelry counter," was the startling response. Of course, the jewelry had contained no gold at all.



#### A TYPICAL SPECTROGRAM

Projected on a screen as seen at the right, this pattern of vertical bars shows what metals the sample contains. The upper set of bars is from the film made of the sample, while the lower set is from a master spectrogram film showing all the metallic elements for comparison



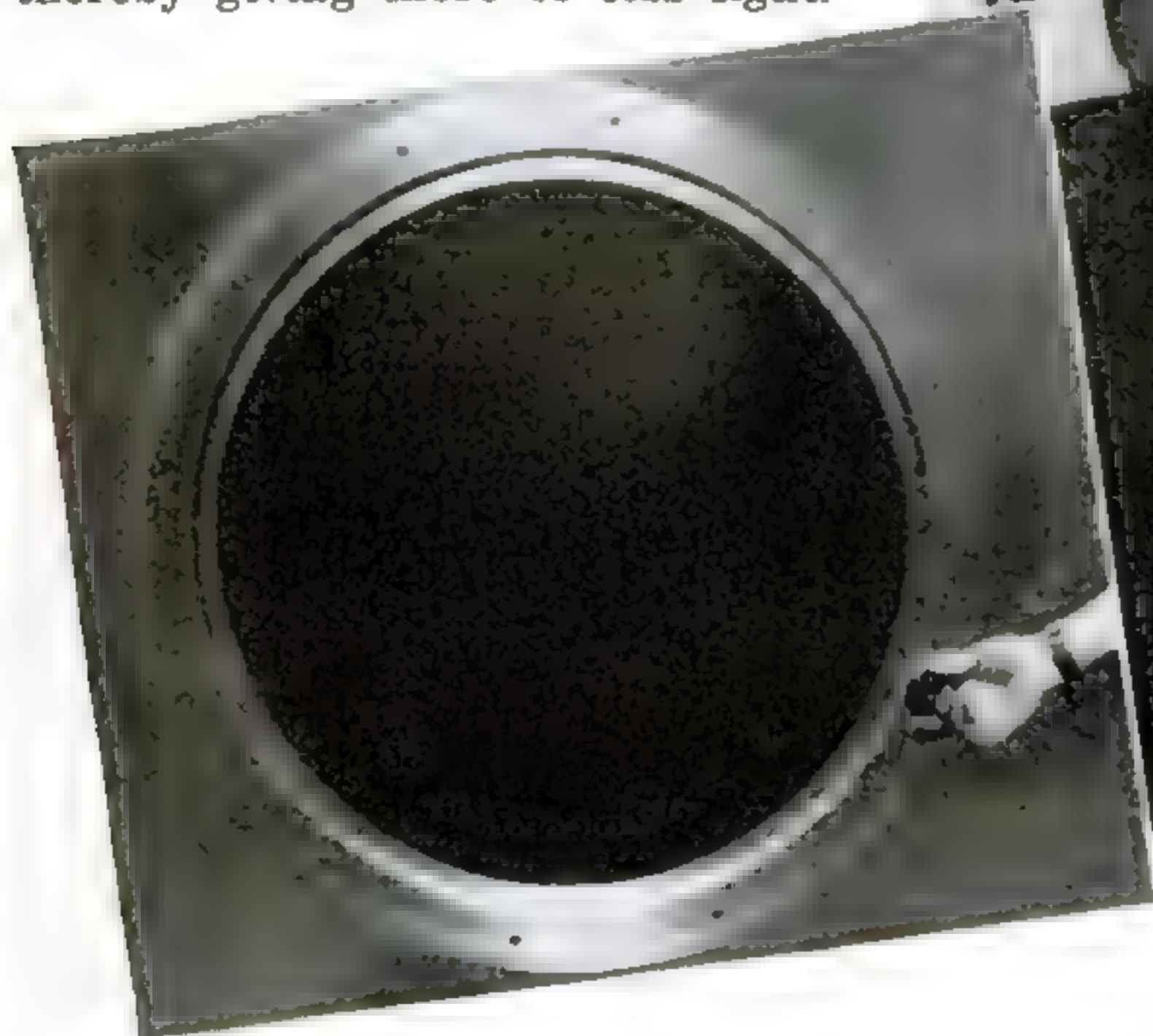
This is the spectrograph. The open chamber contains a carbon arc in the cavity of which a sample of ore is placed





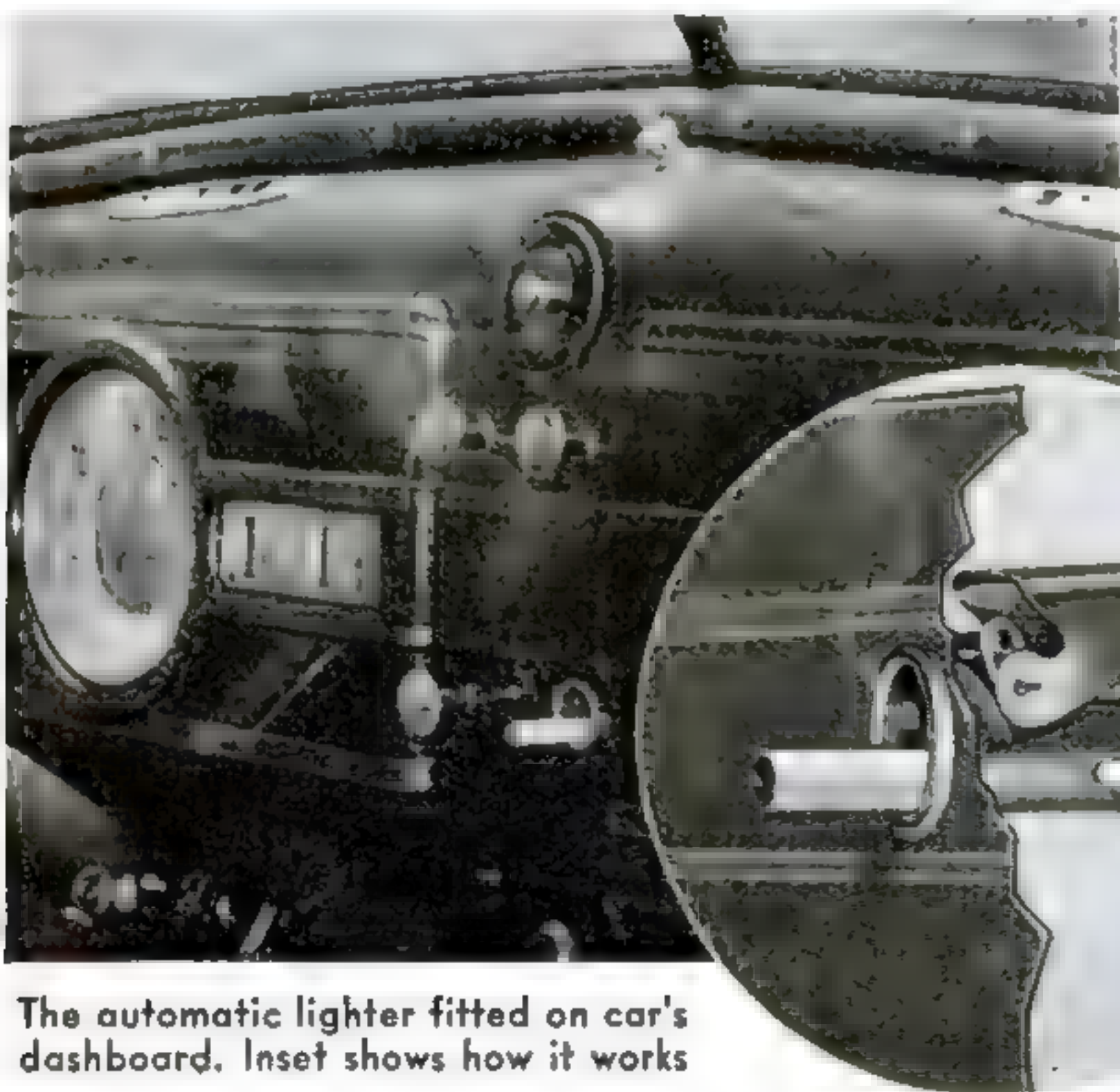
## Novel Train Windows Give Light Control

SHADES are not necessary on the light-conditioned windows recently installed in the observation car of a crack Union Pacific streamline train. Circular in shape, each window has three panes, the outside pane of plate glass, and the two inside panes of a light-polarizing material (P.S.M., April '36, p. 20). The innermost pane can be rotated by a knob to change the relation of its optical axis to that of the second polarizing pane, thereby giving more or less light.



Glare-free polarized light from out of doors is regulated in this special observation car by a twist of the window knob, as at the left

## Dashboard Cigarette Lighter Works Automatically



AUTOMOBILE drivers do not have to take their eyes from the road while lighting a cigar or cigarette when their cars are fitted with an automatic lighter just announced. Inserting a cigarette into a cylindrical tube set in the dashboard actuates an electric heater unit that lights the cigarette.

The automatic lighter fitted on car's dashboard. Inset shows how it works

## Scout Plane Rides on Bomber's Back

BOMBING planes that carry tiny, powerful combat planes after the manner of the British pickaback commercial plane recently tested, have been suggested as a military development of the twin-plane principle. The fighter escort would be released to protect the bomber from overhead attack.





Jerry, the lineman's pup, helping his master wire a power pole

## Pole-Climbing Pup Helps Lineman

SCRAMBLING up extension ladders is all in the day's work for Jerry, a climbing canine who always accompanies his master, a Miami, Fla., electrician, wherever his work takes him. In the photograph at the left, the dog is shown perched on the cross arm of a power-line pole which his owner is preparing to wire. Unfortunately, the pup is not acrobatic enough to scamper down ladders, and must depend on his master to take care of all descents.

## Illuminated Lens Fits Power Tools

FINE work with home-workshop power machines is made easier with the aid of a combination magnifying glass and electric bulb that enlarges and illuminates the operator's view of his work. The unit clamps to the machine's guide post, as shown below.



Combined magnifying glass and lamp as mounted for use with a band saw

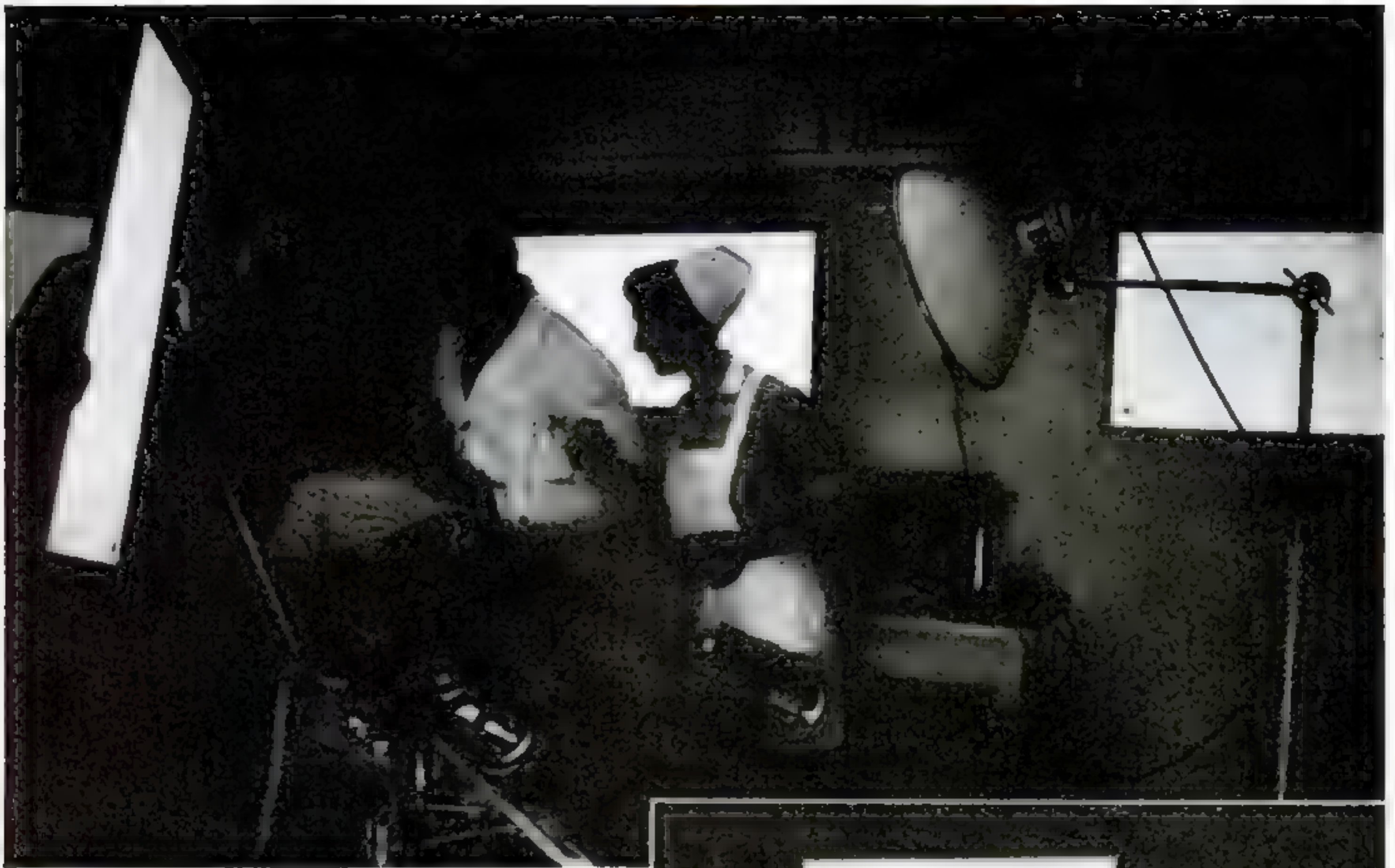
## Ink-Bottle Stopper Fills Pens



Pen is inserted in the rubber sleeve and the bottle turned up

SERVING both as a filling device and a cork, a handy ink-bottle attachment simplifies filling a fountain pen. Consisting of a flexible rubber sleeve, the unit fits snugly into the neck of an ink bottle. The fountain pen is inserted into this sleeve, which stretches to accommodate it and insure a leakproof fit. The bottle is then turned upside down and the pen filled with no danger of spilling ink or getting it on the fingers. Between fillings, a rubber stopper is inserted in the sleeve to make it serve as a cork.



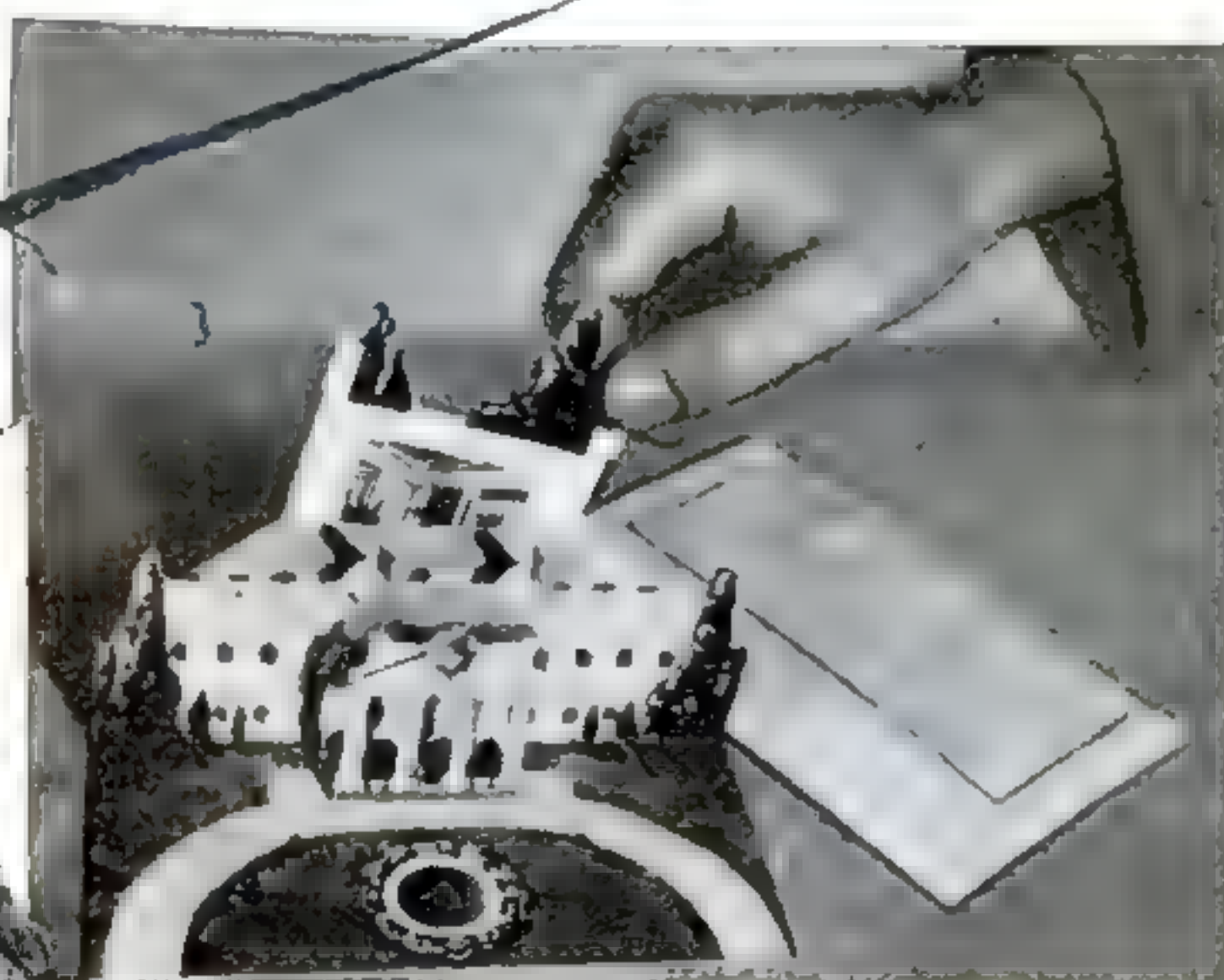


## Luminous Screens Provide Emergency Air-Raid Light

TO SAFEGUARD vital spots such as hospital operating rooms, power-plant switchboards, telephone central offices, and crowded bombproof cellars in case of the failure of electric current during a war-time air raid, ingenious light screens are now being tried out in Germany. Made of cloth or paper, the screens are coated with a luminous paint which absorbs light during the daytime or when lamps are on, and then radiates it in the darkness. Photographs show two applications of the novel lighting method.



A desk lighted by a luminous screen. In the upper photo, the same system is applied to a hospital operating room



Three-dimensional post-card view of the White House

## Set-Up Scenic Post Cards

THREE-DIMENSIONAL picture post cards that fold flat for mailing are now available to tourists. Representing famous buildings and monuments, they can be raised into an upright position like the fancy valentines supplied to children. At the left, one of the novel post cards is being set up.

## Detects Carbon Monoxide

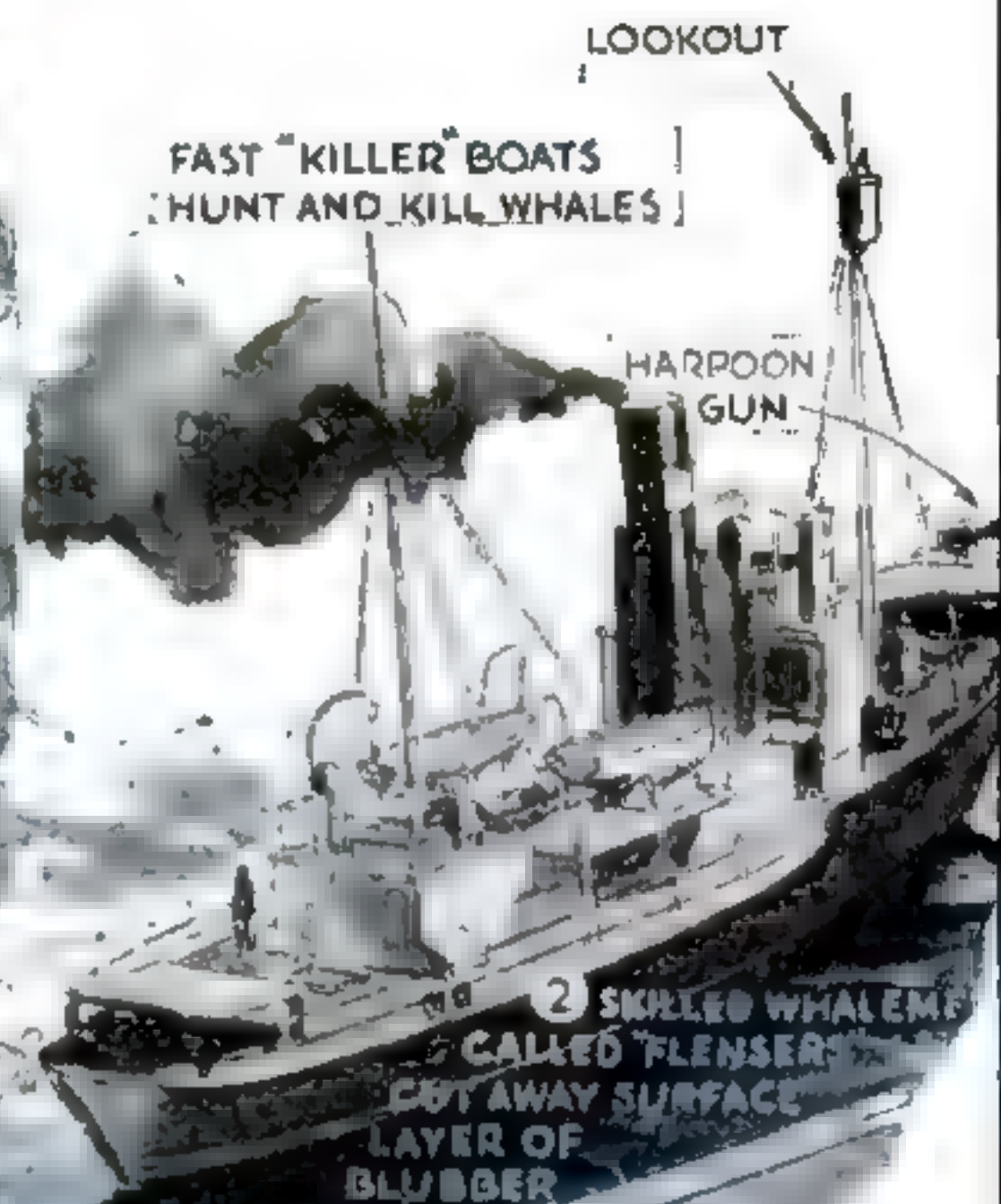
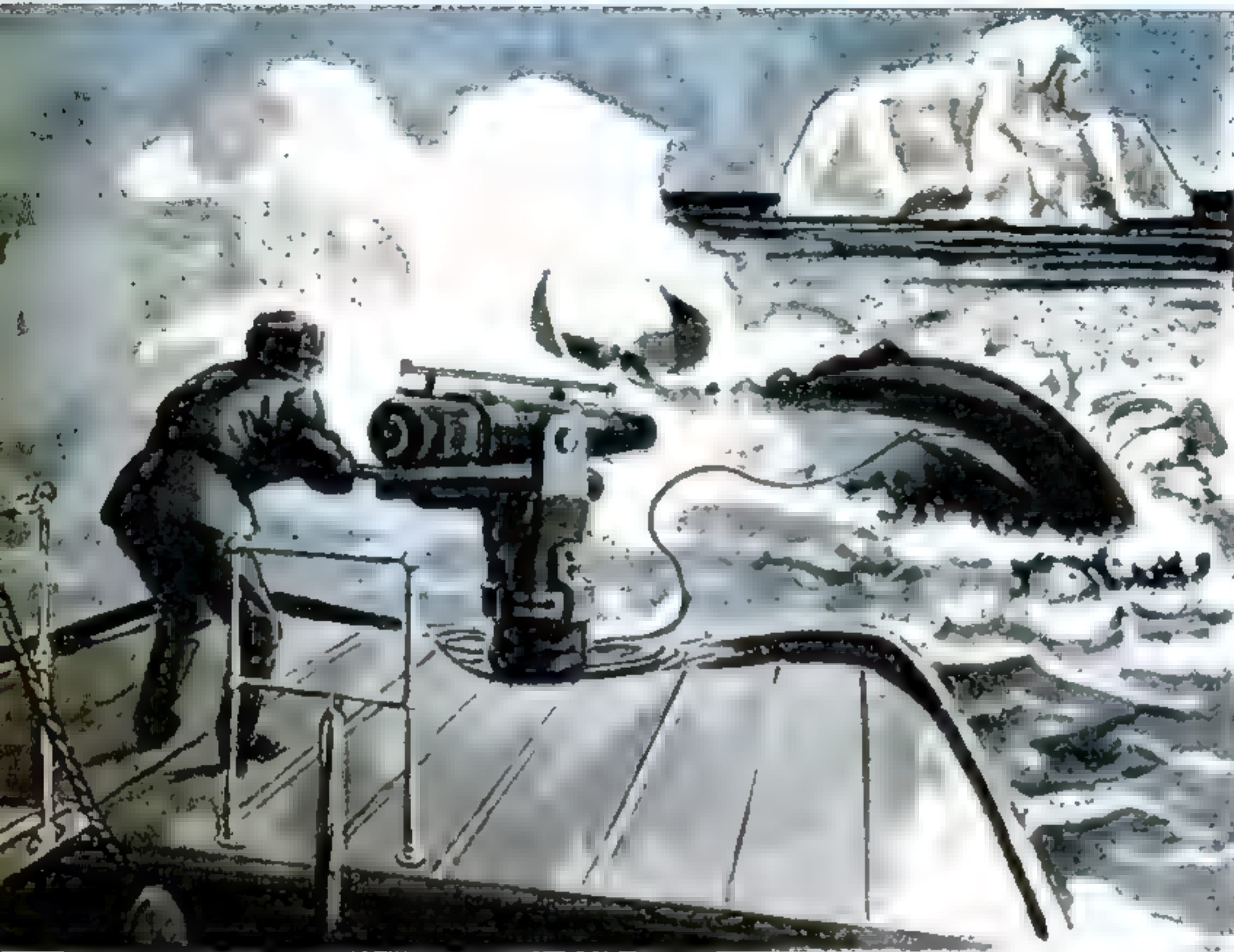
DANGEROUS amounts of carbon monoxide in the air are detected by a homemade device recently invented. A bicycle pump forces air through the apparatus, and the concentration of the gas is shown by the number of strokes required to color a chemical reagent.



# Floating Factory

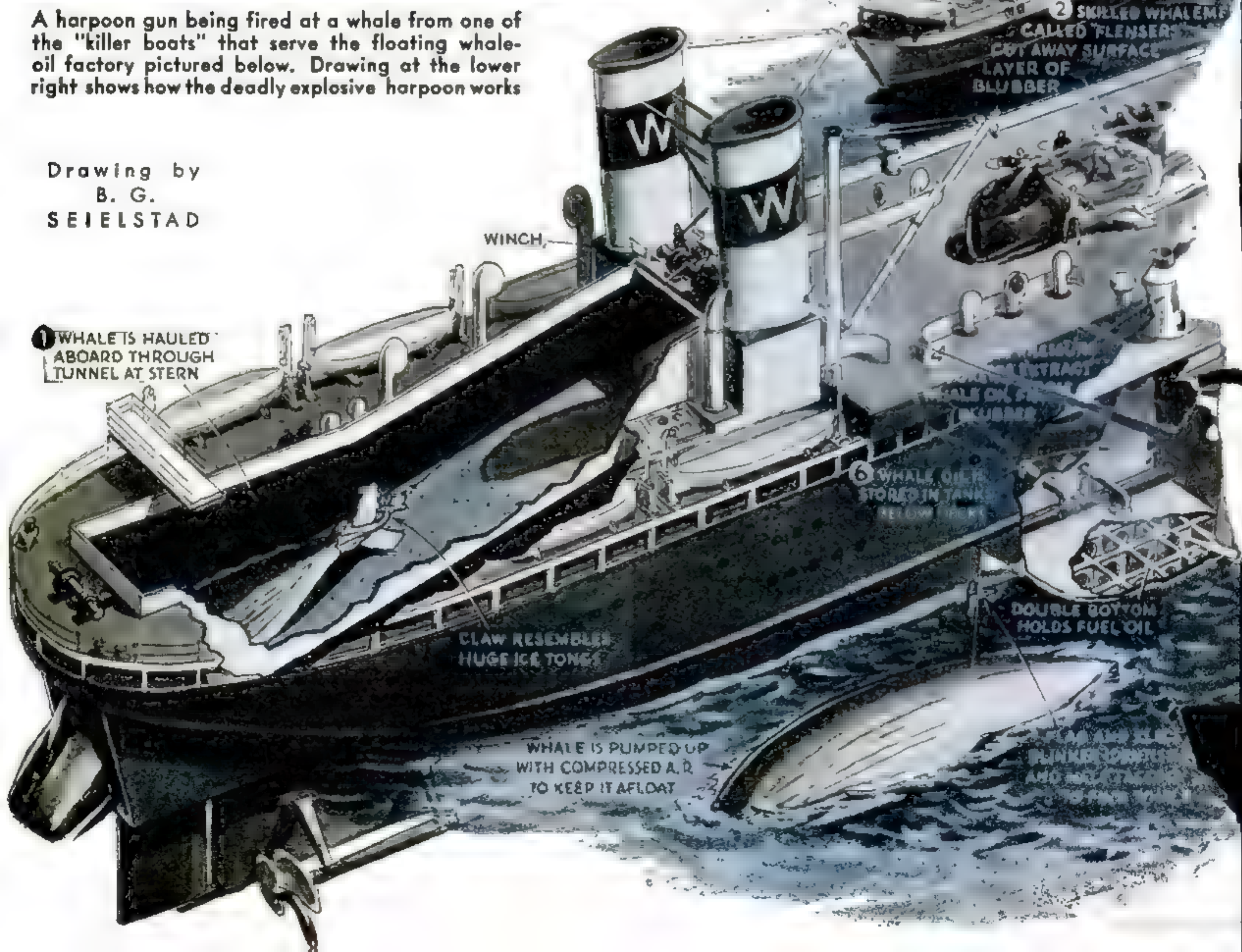
FAST "KILLER" BOATS,

BRING GREAT CHANGES



A harpoon gun being fired at a whale from one of the "killer boats" that serve the floating whale-oil factory pictured below. Drawing at the lower right shows how the deadly explosive harpoon works

Drawing by  
B. G.  
SEIELSTAD



1 WHALETS HAULED  
ABOARD THROUGH  
TUNNEL AT STERN

WINCH

CLAW RESEMBLES  
HUGE ICE TONG

WHALE IS PUMPED UP  
WITH COMPRESSED AIR  
TO KEEP IT AFLOAT

6 WHALE OIL  
STORED IN TANKS  
BELOW DECK

DOUBLE BOTTOM  
HOLDS FUEL OIL

WHALE  
EXTRACT  
WHALE OIL FROM  
BLUBBER

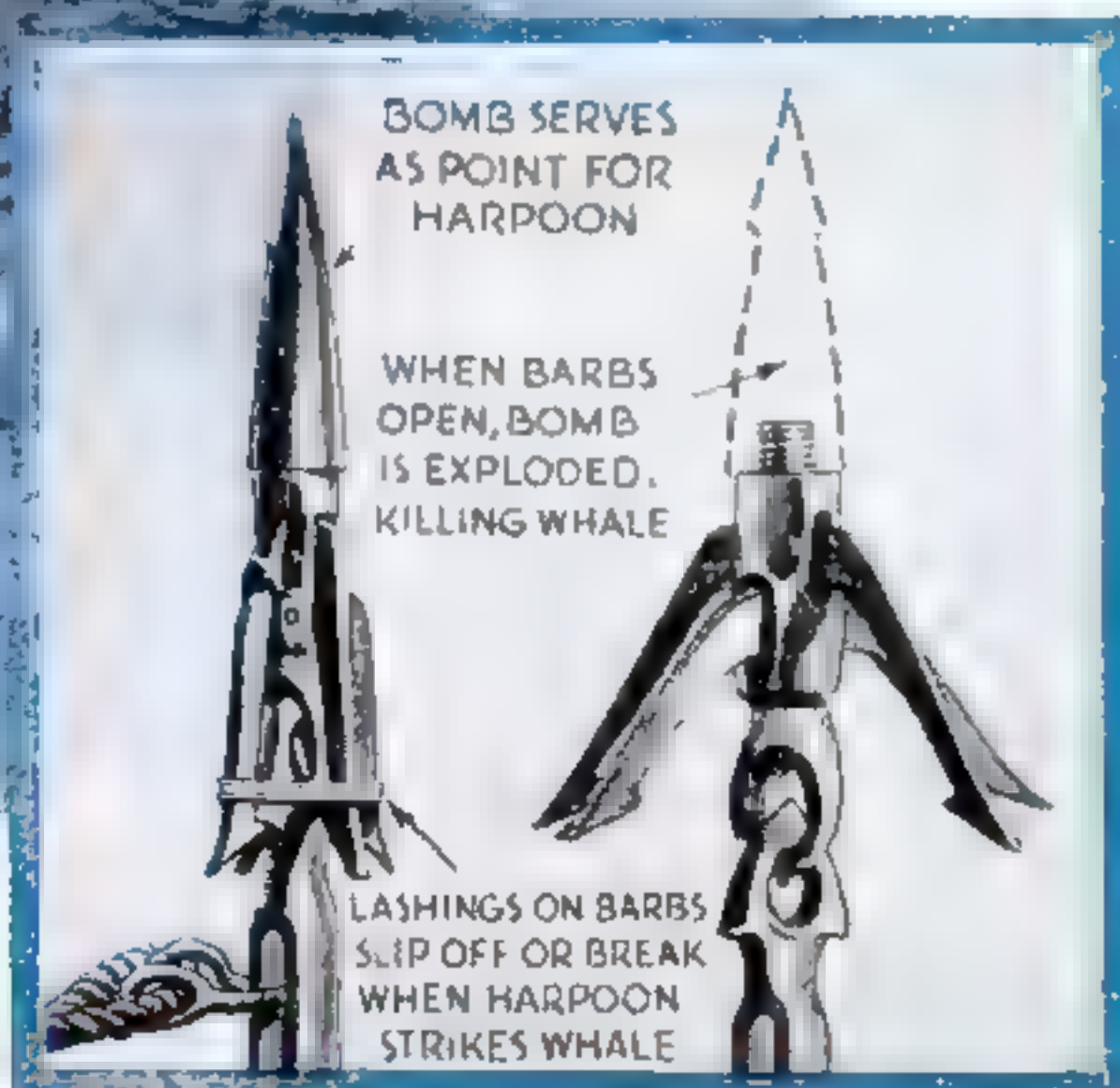
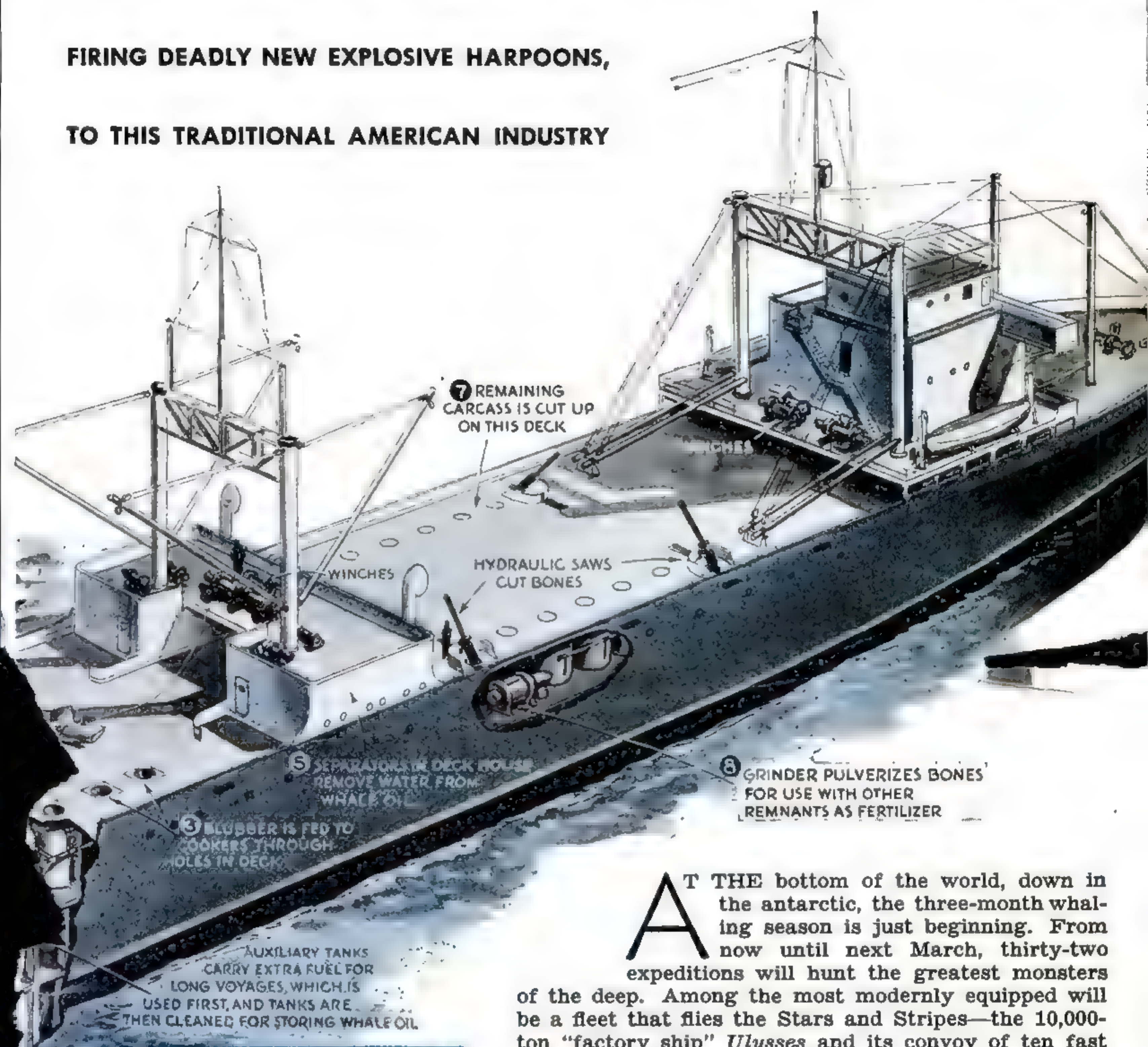
2 SKILLED WHALEMEN  
CALLED "FLENSERS"  
CUT AWAY SURFACE  
LAYER OF  
BLUBBER



# Aids Modern Whalers

FIRING DEADLY NEW EXPLOSIVE HARPOONS,

TO THIS TRADITIONAL AMERICAN INDUSTRY



AT THE bottom of the world, down in the antarctic, the three-month whaling season is just beginning. From now until next March, thirty-two expeditions will hunt the greatest monsters of the deep. Among the most modernly equipped will be a fleet that flies the Stars and Stripes—the 10,000-ton “factory ship” *Ulysses* and its convoy of ten fast 140-foot “killer” boats.

In recent years, British and Norwegian ships have held a virtually undisputed monopoly of the whaling industry, supplying millions of dollars' worth of whale oil to soap manufacturers and others who use it. Gone from the sea were the adventurous American whalers that once put out by the hundreds from centers like Nantucket and New Bedford, Mass. Then, last year, began a revival of large-scale whaling by Americans.

In April 1938 the *Ulysses*, converted from a tanker into a giant floating whale-oil factory, returned from its maiden voyage to the southern whaling grounds. It bore 9,000 tons of whale oil, valued at \$1,000,000. Fighting storms worse than tropical hurricanes, and often working in half darkness, the modern inheritors of the American whaling tradition captured more than 4,000 whales. Their prize kill, a blue whale ninety-





six feet long and weighing 192 tons, was the record catch of the season in the Weddell Sea. Encouraged by these successes, the owners of the *Ulysses* and its auxiliary fleet have planned a larger expedition for the present season, with 400 men.

Whaling has changed vastly since the era of the New England whalers. In those days, killing a whale meant a perilous close-range combat with harpoons and lances, in a whaleboat propelled by oars or sails. Then the invention of the harpoon gun, with its explosive projectile, made the "kill" quicker and safer. Finally, the third and modern era of whaling has brought "factory ships" like the *Ulysses*—large-scale blubber-treating plants afloat, served by a whole fleet of speedy "killer ships."

The ten 140-foot boats that follow the *Ulysses* do the actual hunting. From bow guns, they fire 200-

Through this inclined tunnel at the stern, whales killed by the smaller vessels are dragged up onto the deck of the "Ulysses" where the blubber is cut away for cooking

Operating like giant cream separators, the machines at the right remove the water that is mixed with the oil when it is extracted from the whale blubber







Flagship of an American whaling fleet—the factory ship "Ulysses"

pound harpoons that explode three seconds after hitting a whale, instantly killing it. Then the huge body is pumped up with compressed air to keep it from sinking, and marked with a flag and a blinking light to help the *Ulysses* find it. The factory ship hauls the carcass aboard through an enormous inclined runway in the stern, the blubber is then "tried" or cooked, and the resulting oil is stored in the ship's giant hull tanks.

Below are some tools of the modern whaler: blubber knives, blinker light for marking the carcass, and compressed-air hose for blowing it up. Right, a 200-pound explosive harpoon





Ralph Doremus, assistant to Blackstone the magician, at his odd traveling workbench

# Workshop In Trunk Aids Magician

All tools needed to service the magician's stage equipment can be stored in the medium-size trunk



**S**ERVICING and repairing the secret mechanism that causes a live horse to vanish into thin air is one of the odd tasks assigned to Ralph Doremus, stage manager for Blackstone, the famous American magician. For this and other curious jobs, Doremus devised the self-contained, portable tool chest shown in the photographs on this page. Mounted on substantial casters that allow it to be rolled easily around a stage, the chest, constructed from an old wardrobe trunk, provides a place for a soldering iron, saws of various types and sizes, a vise, a complete set of carpenter's tools, a motor-driven compressor, a paint-spray gun, a shaded lamp to illuminate the work at hand, and other miscellaneous equipment. An electric extension cable makes it easy to tap local electric supply lines, and outlet receptacles are provided



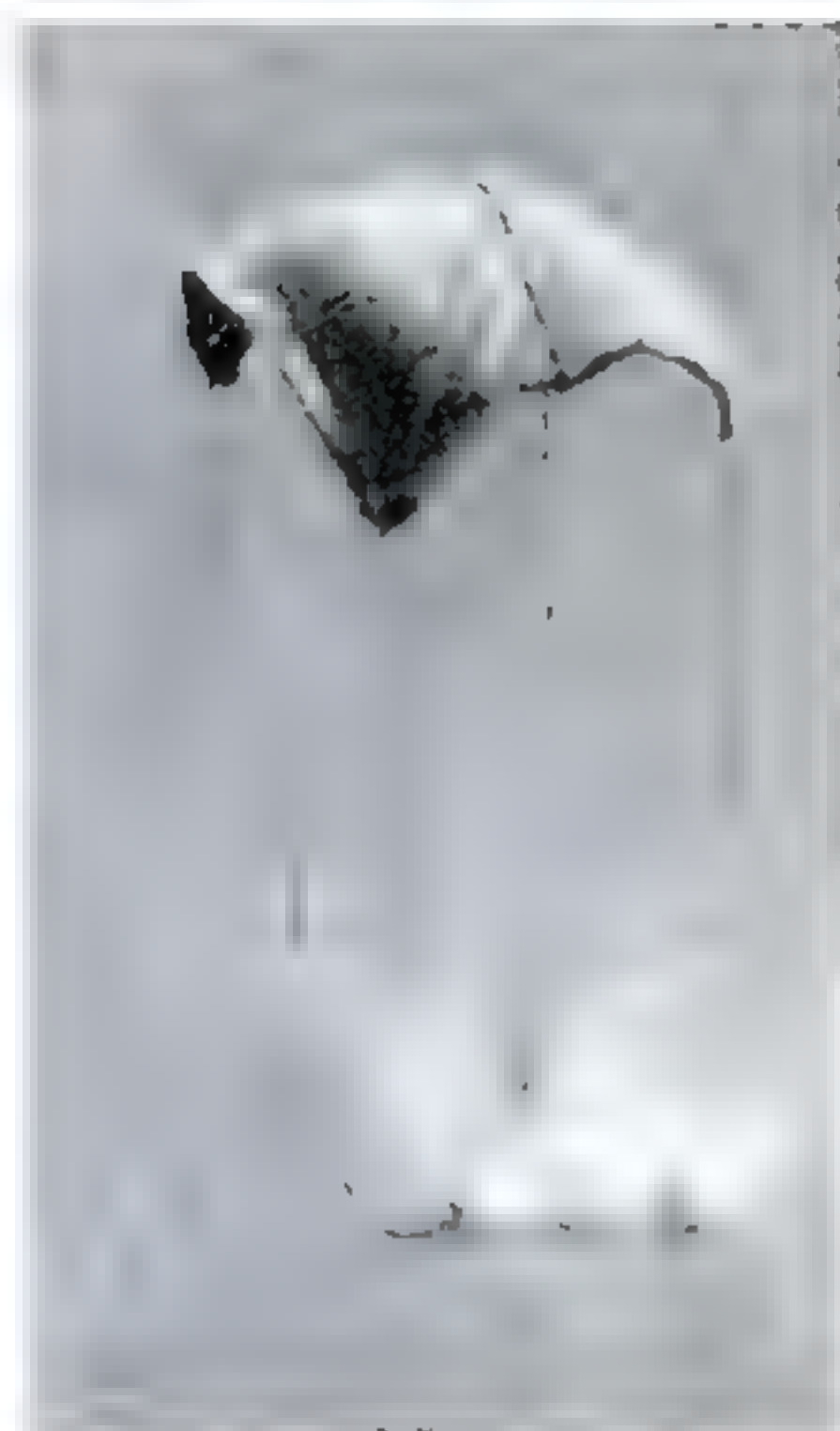
Four rubber-tired casters attached to one end of the trunk, and a fifth on the same end of the lid, make the chest literally a workshop on wheels to simplify moving

for plugging in the chest's electric power tools. Not the least important of the chest's features is a built-in fan to keep the touring repairman cool during the hot summer months. In its travels from theater to theater during the past year, the compact unit has been examined and admired by hundreds of lovers of magic, many of whom were homeworkshop fans who subsequently made duplicates of the chest with minor changes in their interior arrangements, to adapt them for their own uses.





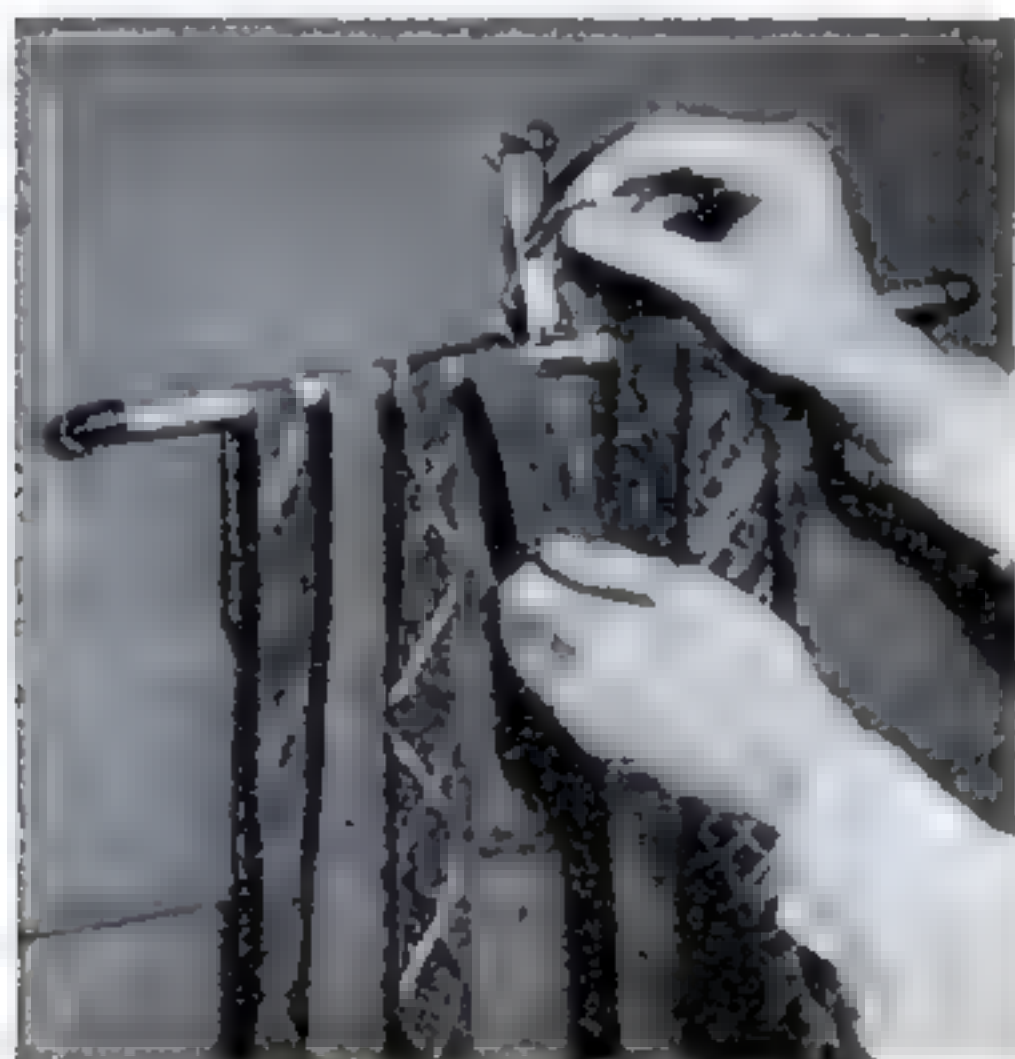
Left, a can of fish being dropped from a plane. Below, slowed by a parachute, the fish land safely



## Plane Drops Fish To Stock Lake

**P**ACKED in tin cans attached to diminutive parachutes, thousands of young fish were recently dumped from a speeding seaplane into the waters of Lake Washington by Washington State game officials to see whether they would survive the shock of their

1,000-foot drop into the water. The first experiment of its kind in the United States, it proved that remote mountain lakes could be successfully stocked with fish by airplanes. Results demonstrated that the fish were not harmed by the unusual method of stocking.



## Spring Holds Ties on Handy Rack

TIES hung over a compact new tie rack that fits flat against a wall or a closet door are held firmly in place. When a lever on the rack is pressed, the rod springs away from the wall and the ties are then easily removed by pulling, as illustrated in the photograph above.

## Meter Tells When Walls Are Dry

DISCOLORATION and blistering, caused by painting or papering over walls that are not absolutely dry, can be largely eliminated, according to the makers of a moisture meter recently placed on the market. Operating on an electrical-resistance principle and powered by a self-contained battery, the meter registers the moisture content of newly applied plaster, thereby indicating whether the wall is dry enough for the application of paint or wall paper. In use, a testing unit, connected to the case containing the meter dial by a flexible cord, is held against the wall surface.

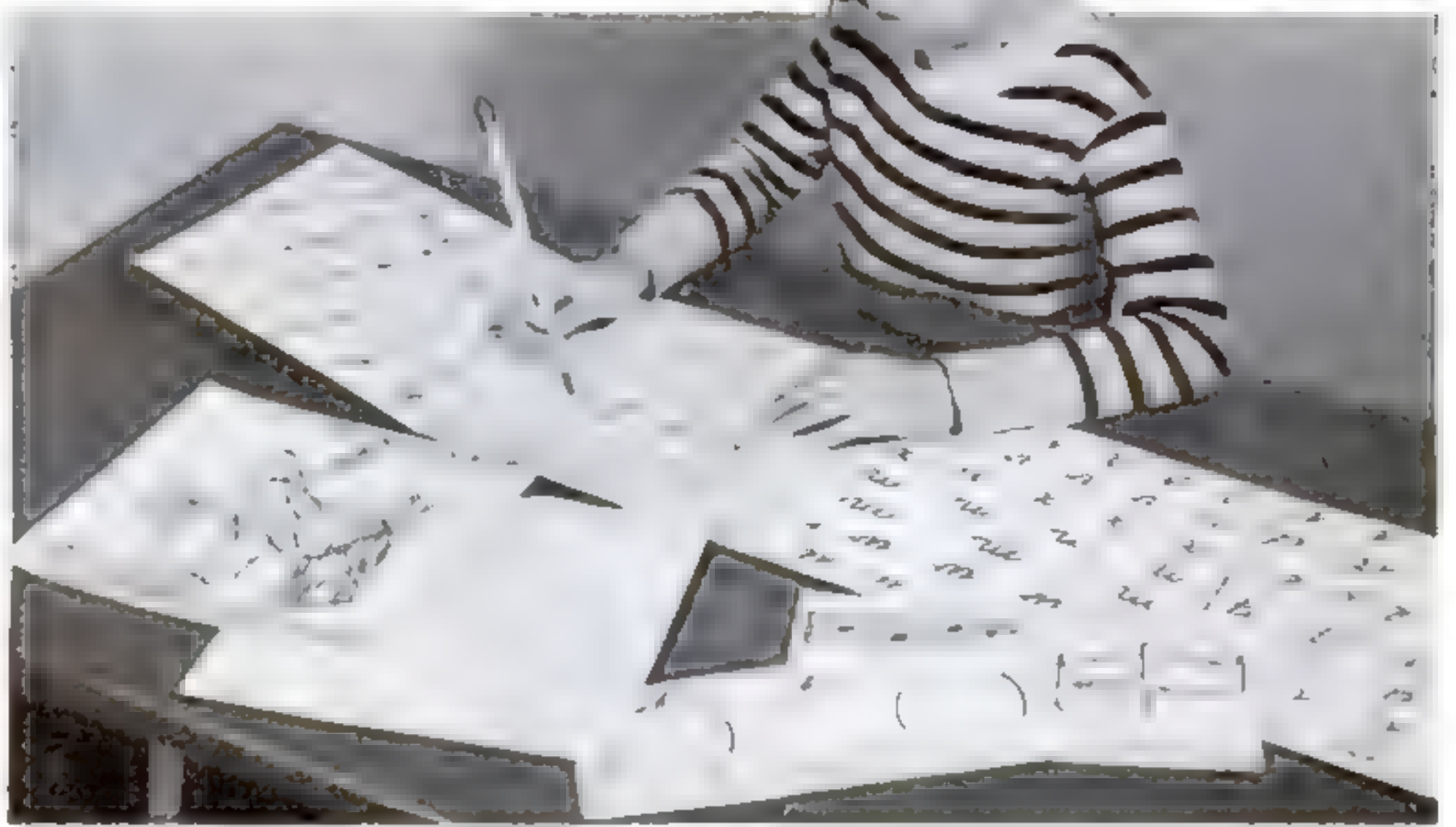




## Chart Helps Child Learn To Write

CHILDREN are now being taught how to write the letters of the alphabet in script by means of novel charts recently invented. The charts consist of folders of heavy cardboard in which are grooved script letters. A child places a sheet of transparent paper over the chart and traces with a blunt pencil the indented chart letters until he becomes familiar with their form. In smooth spaces between the grooved letters, he also can try drawing them free-hand, without the artificial aid.

Tracing the written letters in the grooved board, a child soon learns to make them without any assistance



Cut to fit the nose, the pads relieve eye weariness

## Pads Relieve Eye Fatigue and Aid Complexion

EYE PADS that are said to have a refreshing effect on tired eyes are now available as a new aid to beauty. Made of featherweight felt, the eye masks are impregnated with a special solution. As shown in the photograph at the left, the user tilts the head back, presses the pads gently over the eyes, and then leaves them on for a period of about five minutes. Stimulating the circulation of the blood in areas around the eyes, the pads are said to relieve discolorations.



The gunner sits in a special rest to adjust the sights of this new machine gun

## New Air-Defense Gun Gets Test

REMARKABLE accuracy is claimed for a new rapid-fire gun which was given its first official trial recently by U.S. Army officers at Fort Bragg, N.C. Developed especially for antiaircraft use, the .50 caliber defense arm is operated by a gunner who steadies himself in a novel rest pictured at the left as he regulates the weapon's delicate aiming mechanism. The new weapon is designed for use against low-flying planes.





## Giant Iron Lung Gives Treatment to Four at Once

FOUR persons may be treated at the same time in a novel multiple iron lung recently placed in service at the Children's Hospital, Boston, Mass. It is explained that the medical profession is not invading the field of mass production, but rather that research studies have indicated that a single pressure and breathing rate may be used for a number of patients afflicted with respiratory ailments that require the use of a mechanical aid to breathing. Since four separate units would take up too much space and complicate hospital routine in handling such cases, the two-decker shown in the photograph at the left was constructed. Other advantages claimed for the device include a reduced expenditure for operation, compared with the cost of running four separate machines, and also the fact that each patient has company and can carry on conversations with others.

Patients can keep one another company in this four-passenger iron lung

## Electric Branding Gun Replaces Heated Iron

CATTLE are marked quickly, easily, and humanely with a novel electric branding gun invented in New Zealand. Powered by a six-volt car battery when regular current is not available, the branding device is said to require only five seconds to heat up to branding temperature. Detachable letters or numerals are inserted in the end of the unit's pistol-shaped body, the trigger is tripped to start the electric heating unit, and the brand is pressed against the flank of the animal. A special searing iron can be attached to the branding gun for use in docking the tails of lambs, saving much time on a large sheep ranch.



When the trigger is pulled, electric current heats the brand

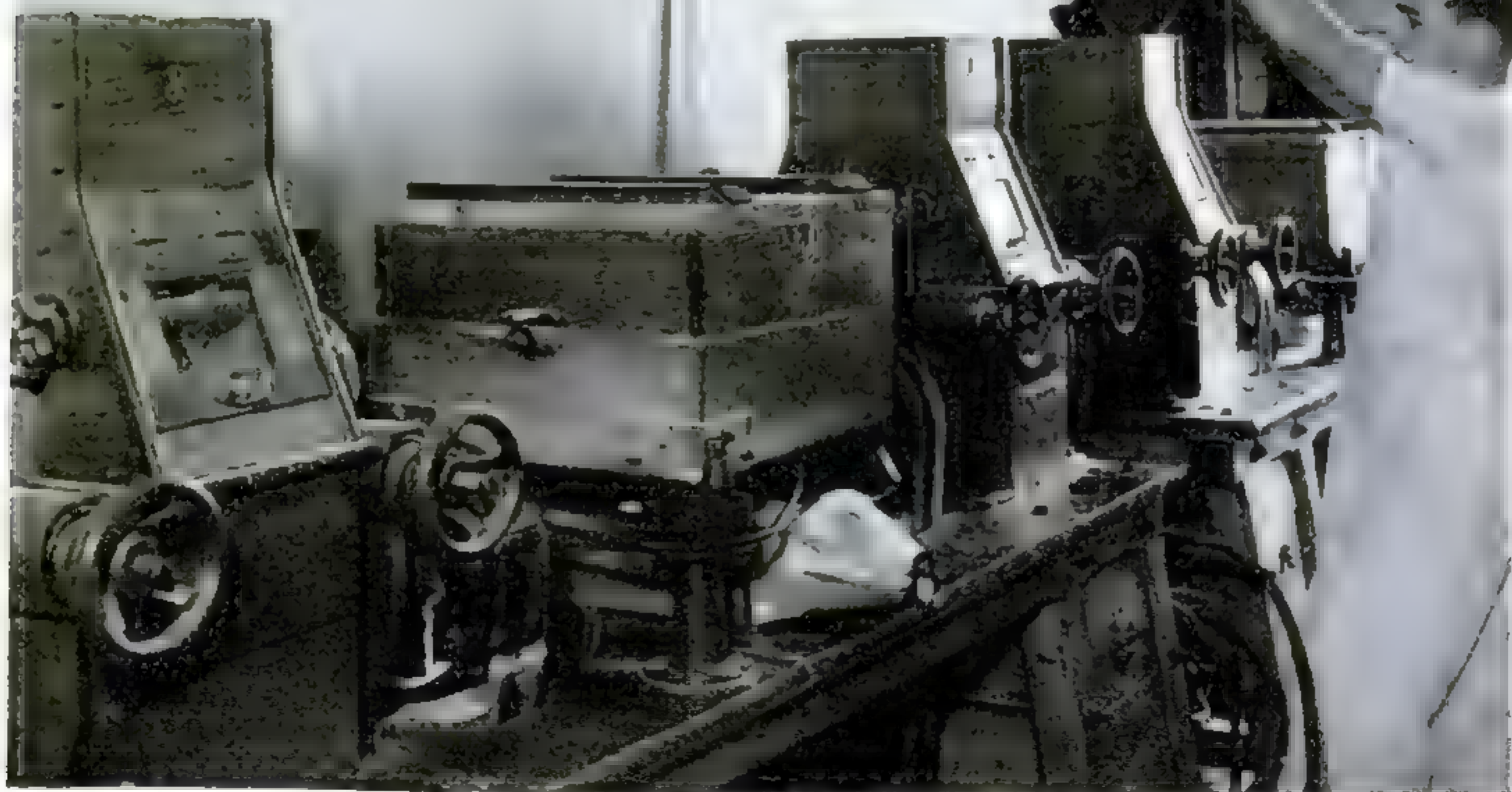


# Science Builds

**W**ORKING on a doll-house scale, in air-conditioned laboratories at Wooster, Ohio, Government scientists bake bread that is never to be eaten and cakes that will never be tasted. Their task is to test samples of experimental wheat from seventeen different states, to determine whether a new variety is suitable for bread, crackers, pastry, or cookies. If so, it soon may find its way to market and your table.

After the experimenters have measured the amount of protein and moisture in samples of wheat, a rotary electric oven bakes eighteen midget loaves at a time—each one about one fourth the size and weight of the kind you buy at the store. Placed on a

Dough from samples of experimental wheat is mixed in this special machine to make bread at the cereal chemistry laboratory, Wooster, Ohio



Miniature flour mills grind the grain in a room which is carefully controlled for temperature and humidity



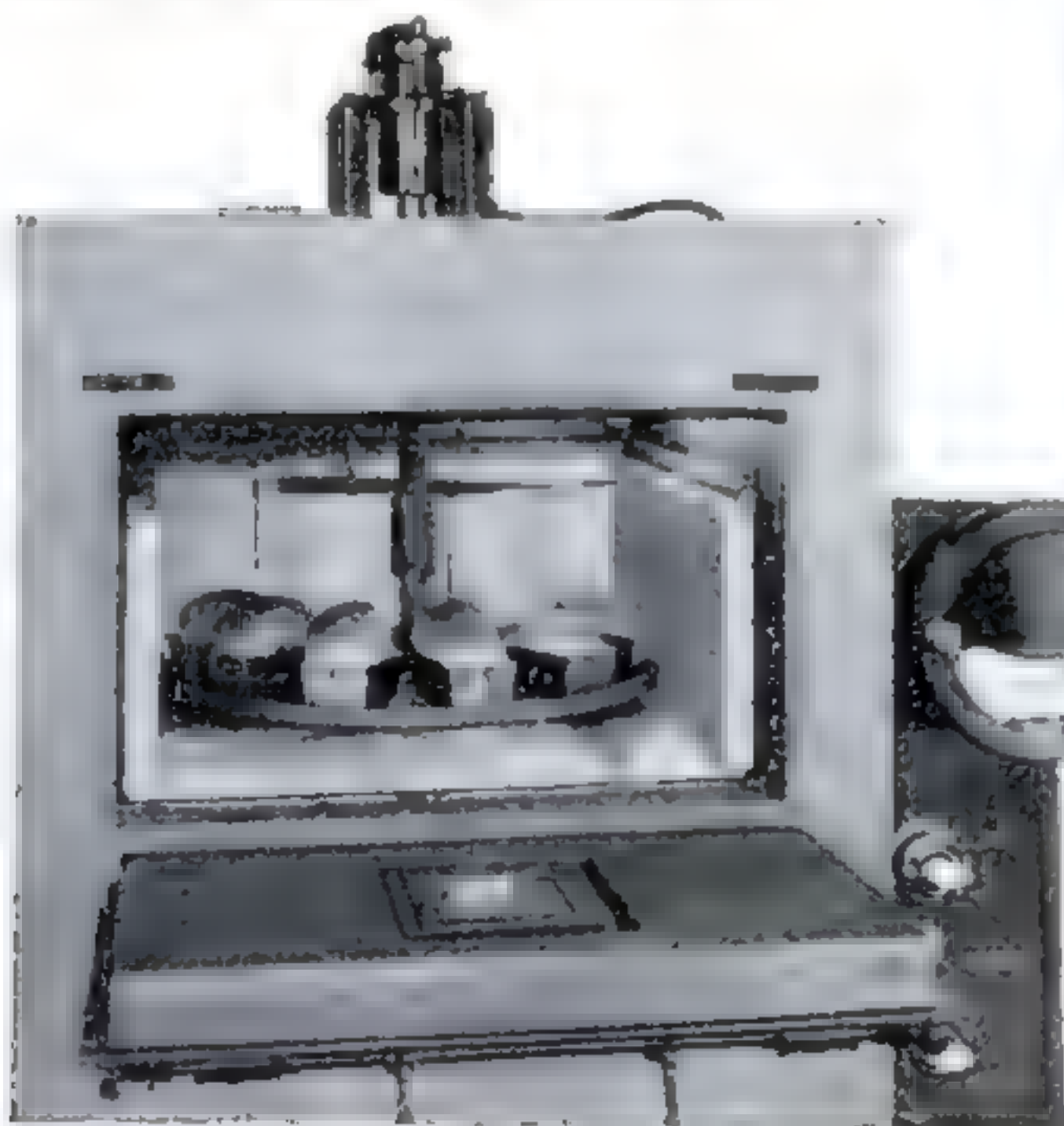
# A Doll-House Bakery

By JAMES L. BURDEN

"scoring shelf," they are judged on such points as color, thickness of cell walls, shape of cells, and number of extra-large holes.

Even the growing of wheat for the loaves is done in miniature. Each row, one rod long, yields a bundle of wheat that may be held in one hand. The threshing machine is a tiny homemade device. Small labeled paper sacks hold the wheat, and care is taken to avoid mixing the wheat from one row with that from another, so that each individual strain can be judged on its merits.

Bread that nobody will eat. These are "pup" loaves, one fourth the size of the standard loaf. They show whether the wheat tested makes good bread



This rotary electric oven bakes eighteen loaves at a time, at a temperature of 450 degrees F.



Practical bread-making tests are supplemented by chemical analysis to reveal the amounts of protein and moisture the wheat contains. This photograph shows the rows of flasks in which samples of wheat are placed



Pygmy loaves on the scoring shelf where they are judged for color, thickness of walls, and other qualities

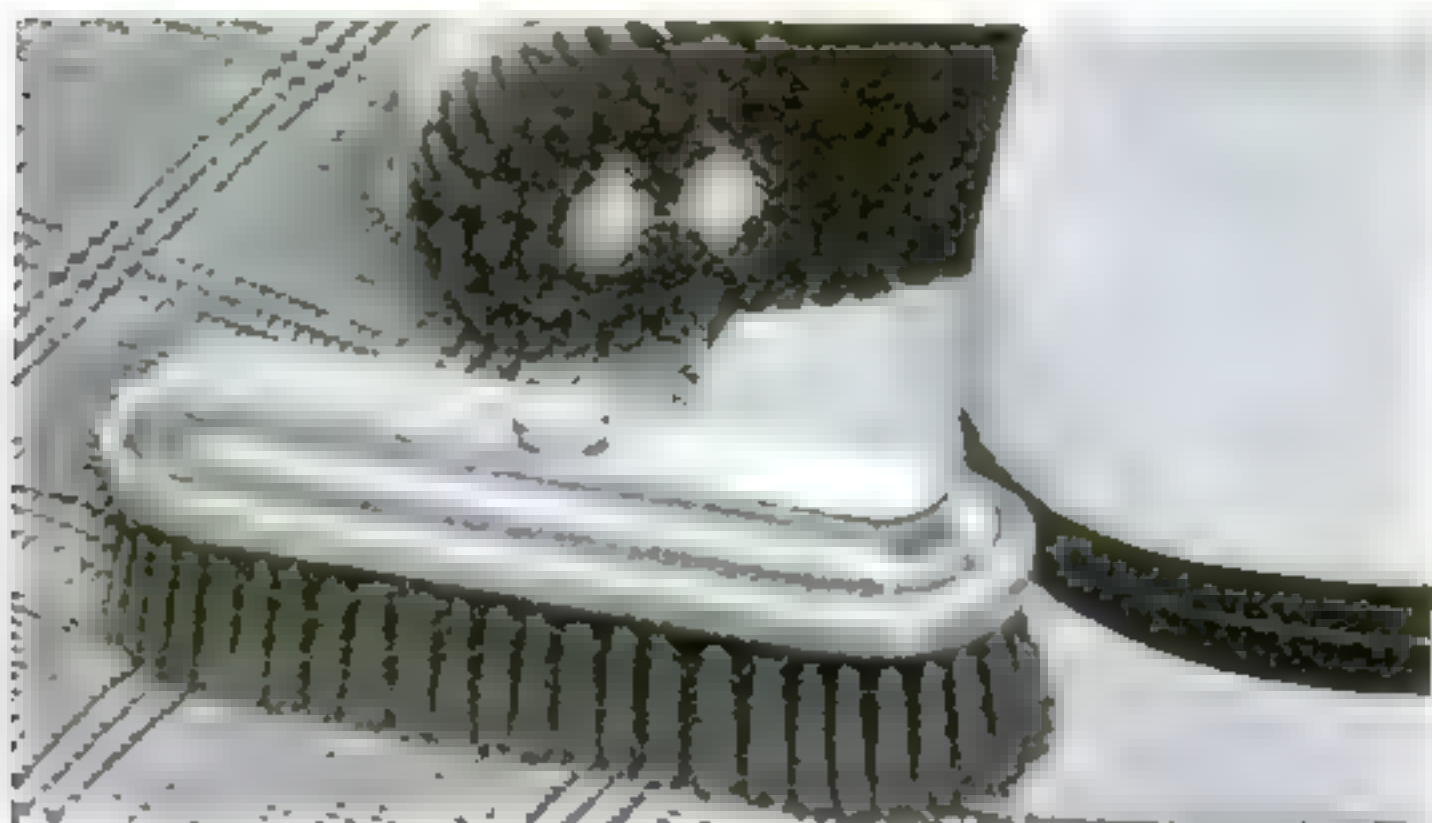


## Scientist Smokes Liquid-Air Cigar, As Novel Stunt

ALTHOUGH at first glance the photograph at the right may seem to show the victim of a practical joke, with a glass of beer near one hand and an exploding cigar in his mouth, it actually depicts Dr. Francis Smith of the National Bureau of Standards, Washington, D. C., demonstrating what happens when a cigar which he has dipped into a glass of liquid air is lighted. Saturated with excess oxygen, the cigar tip flares out like a Roman candle with a brilliant flame five inches long.



Dipped in liquid air and then lit, the cigar flares up like a Roman candle



Note tufts that feed cleaner through the bristles

## Spot-Removing Brush Has Cleaning Fluid in Handle

SPOTS and stains on hats, coats, and other wearing apparel are removed by a novel double-duty clothes brush now available. A reservoir in the handle of the brush is filled with gasoline, benzine, naphtha, or other cleaning fluid which filters down through special tufts and is applied directly to the material being brushed. The use of special bristles is said to give the brush a long life.



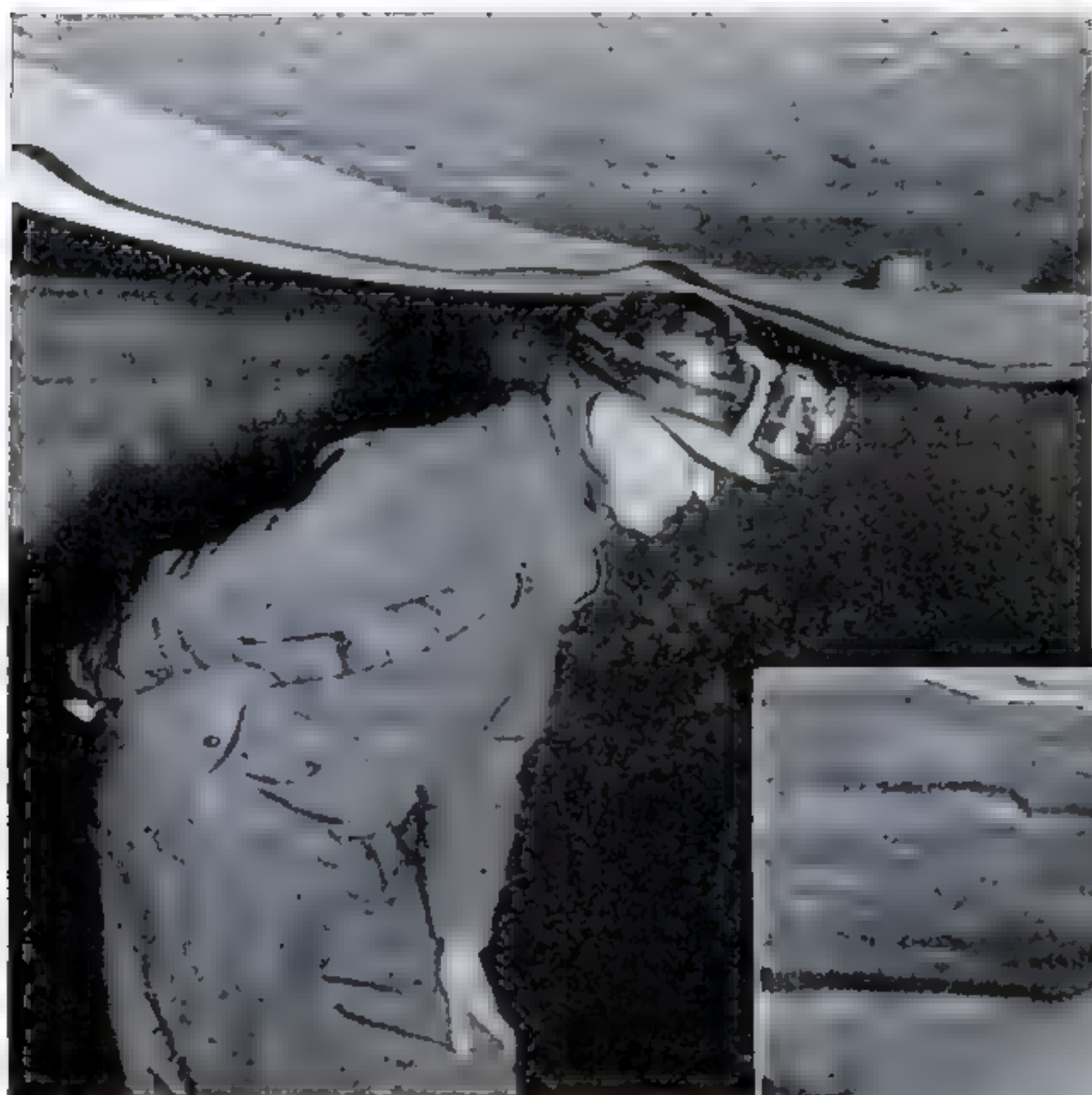
Pressing a button on the handle of the oil can lights the built-in lamp

## Garage Oil Can Gets Headlight

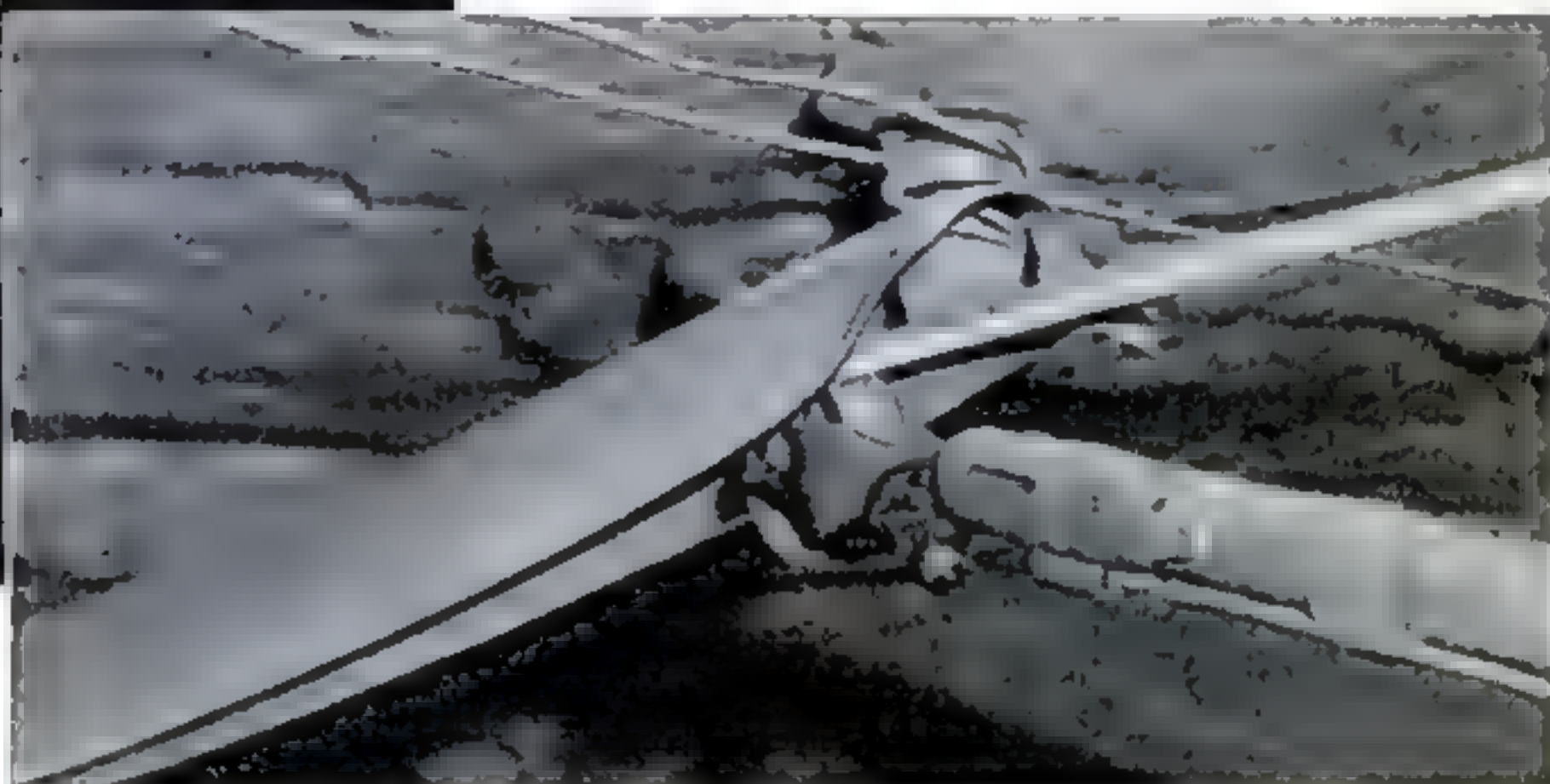
DESIGNED by an English inventor for use by garage and service-station attendants, an oil can for filling automobile crankcases has a built-in flash-light bulb and battery. Especially useful at night, the oil-can headlight throws a bright beam on the filler tube as oil is being poured from the can, to prevent spilling. In the photograph at the left, a garage mechanic is demonstrating the oil-can headlight to a customer.



# Rubber Trolley-Wire Guard Protects Miners



TO PROTECT miners from accidental contact with the overhead high-voltage trolley wires used to supply power to electric locomotives, a new type of rubber guard has just been perfected. Thin sheet rubber, folded double and cured in a permanent U shape, is hung over the bare wire, with notches cut to accommodate the trolley-wire supports. The trolley feeder pole slips easily through the guard, which flexes in either direction if accidentally hit by a workman or by one of his tools.



There's no danger of shock here. Right, how the mine-trolley guard is installed



## "Hot Dogs" Peel Like Bananas

MADE so that they can be peeled like bananas, "hot dogs" with removable skins were displayed recently at a Milwaukee, Wis., butchers' convention. The outside skin in which the Frankfurter is cooked has perforations on opposite sides so that the jacket can be stripped off before the Frankfurter is eaten, as shown in the photograph below.



## Kit Holds Electric-Razor Parts

MECHANICALLY minded men who want an electric razor can assemble their own by purchasing an inexpensive kit now available. Conveniently packed in a cardboard box with full instructions, the unit includes a self-sharpening shaving element that is durable and efficient, and a 110-volt A.C.-D.C. motor fitted with heavy, silver-tipped brushes made of phosphor bronze. The dry shaver is said to be extremely easy to assemble with simple tools. The photograph reproduced above shows various parts of the kit being assembled into a complete electric razor.



## Machine Types, Sets Type, in One Operation

TYPEWRITING and typesetting are accomplished in one and the same operation by an ingenious machine devised for use by business houses which do their own printing. No skilled typesetter is necessary. When a typist, operating the standard typewriter keyboard, strikes the keys, the letters are not only printed on paper but are also set in type, as individual type characters slide down from a sloping rack to their place in a type form.



Type characters drop into place when the typewriter keyboard is operated



## Carvings Cure Homesickness

CARVING scenes depicting life on the farm back east is a sure cure for homesickness, according to "Tennessee Joe" Snavelly, a decorator, or set dresser, employed by various motion-picture studios in Hollywood, Calif. Since he moved to California sixteen years ago, Snavelly has been keeping alive the memories of his old home in the Tennessee hills by making intricate, landscaped carvings of typical farm scenes. Snavelly is pictured beside a sample of his work in the photograph reproduced above.

## Elastic Watch Strap Fits Any Size Wrist

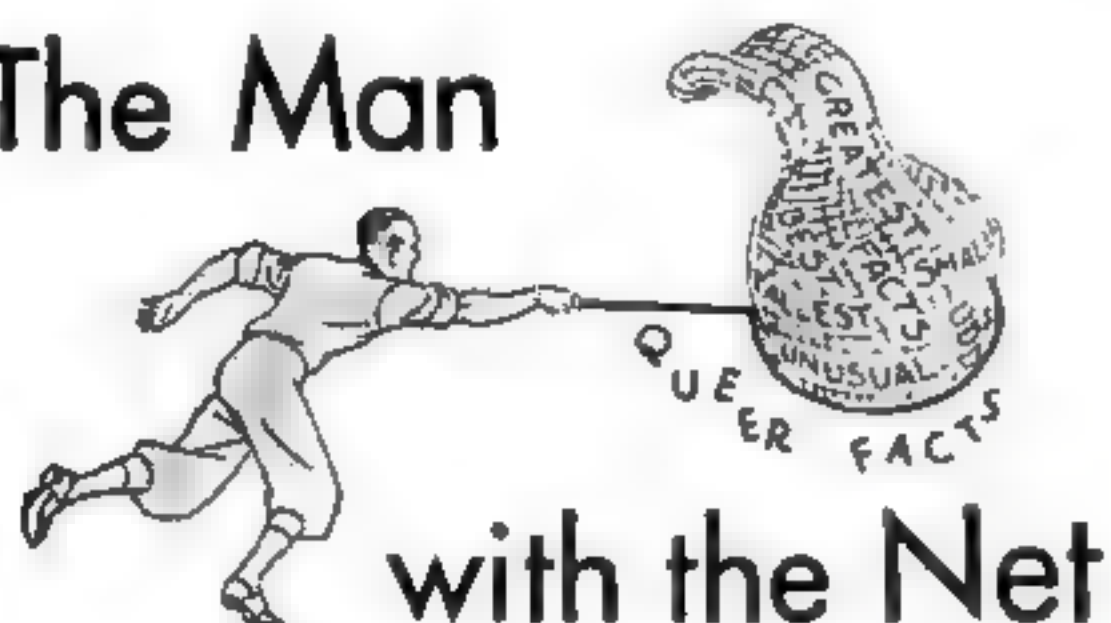
IT IS not necessary to unfasten a novel watch strap now available before putting it on or taking it off the wrist. Made of leather, the strap has a metal-chain insert that expands to allow the strap to be slipped over the hand, and automatically adjusts it to the size of the wearer's wrist. The illustrations below show how the watch is put on, and how the chain insert expands.



A flexible link section replaces the usual buckle on this new wrist-watch strap



# The Man



## with the Net

**CUBA** is the home of the world's smallest frog. It weighs hardly more than three grains of wheat.

**HOLLYWOOD** movies cost an average of \$2,500 an hour to film.

**WHALES** of one species are only four feet long when they are full-grown.

**EIGHT** months is the average life of a dollar bill.



EIGHT MONTHS? THEY  
LAST ONLY EIGHT  
SECONDS WITH ME!

**GOLF BALLS**, when driven from the tee, remain in contact with the head of the club about one five-thousandth of a second.

**SLIME MOLD** has been studied for 200 years, yet scientists are unable to agree whether it is a plant or an animal.

**300,000 tons** is the estimated weight of an average cloud.

**HONEYBEE** races, run like homing-pigeon contests, have been held in New Jersey.

NOT ONLY IN  
NEW JERSEY!



**TWENTY-SEVEN** communities in the United States are named Cleveland; twenty-eight, Troy.

**EVERYBODY** in the world could have half a million dollars' worth of gold if all this precious metal contained in sea water could be extracted.

**ONE QUARTER** of all the bones in a child's body are in the feet.



AND MY TEACHER  
CALLS ME A  
BONE HEAD!



## Beauty-Shop Head Shade

TO PREVENT drying out or otherwise injuring the complexion of beauty-shop customers, a novel beauty hood, shown above, is now in use. Worn around the head like a lamp shade over an electric bulb, the cardboard protector blocks off heat and light radiations from the electric hair drier.

## Edger Protects Papers

BLUEPRINTS, diagrams, leaflets, and other papers which are constantly being handled can be protected from becoming torn at the edges by a new machine that automatically cements a strip of strong transparent paper to the edge to be protected.



A turn of a crank applies the edging to the paper

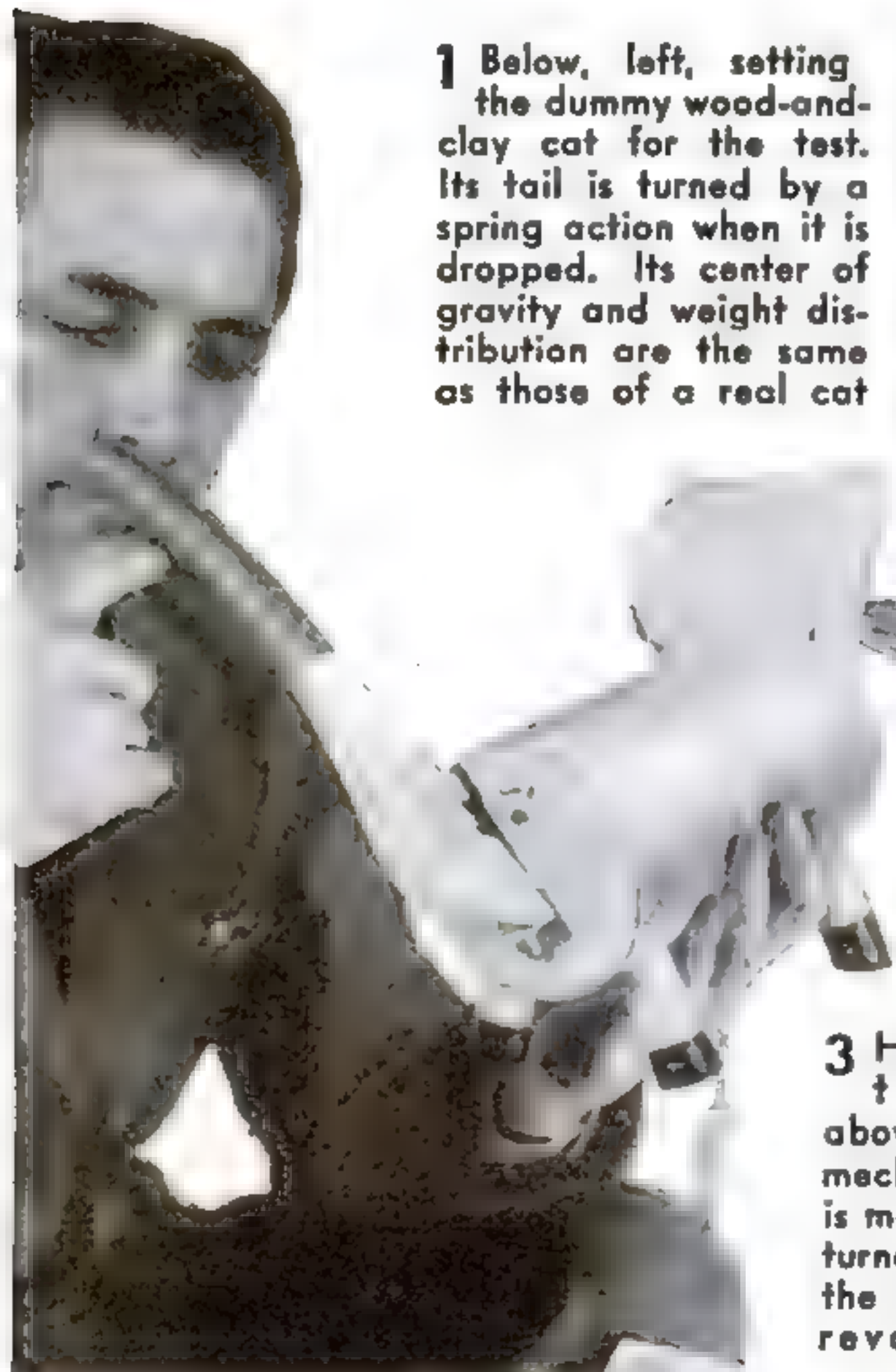


# WHY DO Cats Always Land ON THEIR FEET?

**W**HY does a cat always land on its feet, when dropped upside down? Because it flips itself over with its tail," says an engineer who has built an animated model of wood and clay to demonstrate the idea. When his mechanical kitty is inverted and dropped, a spring mechanism spins its tail through an arc and it rights itself in mid-air, striking the floor upon all four feet.



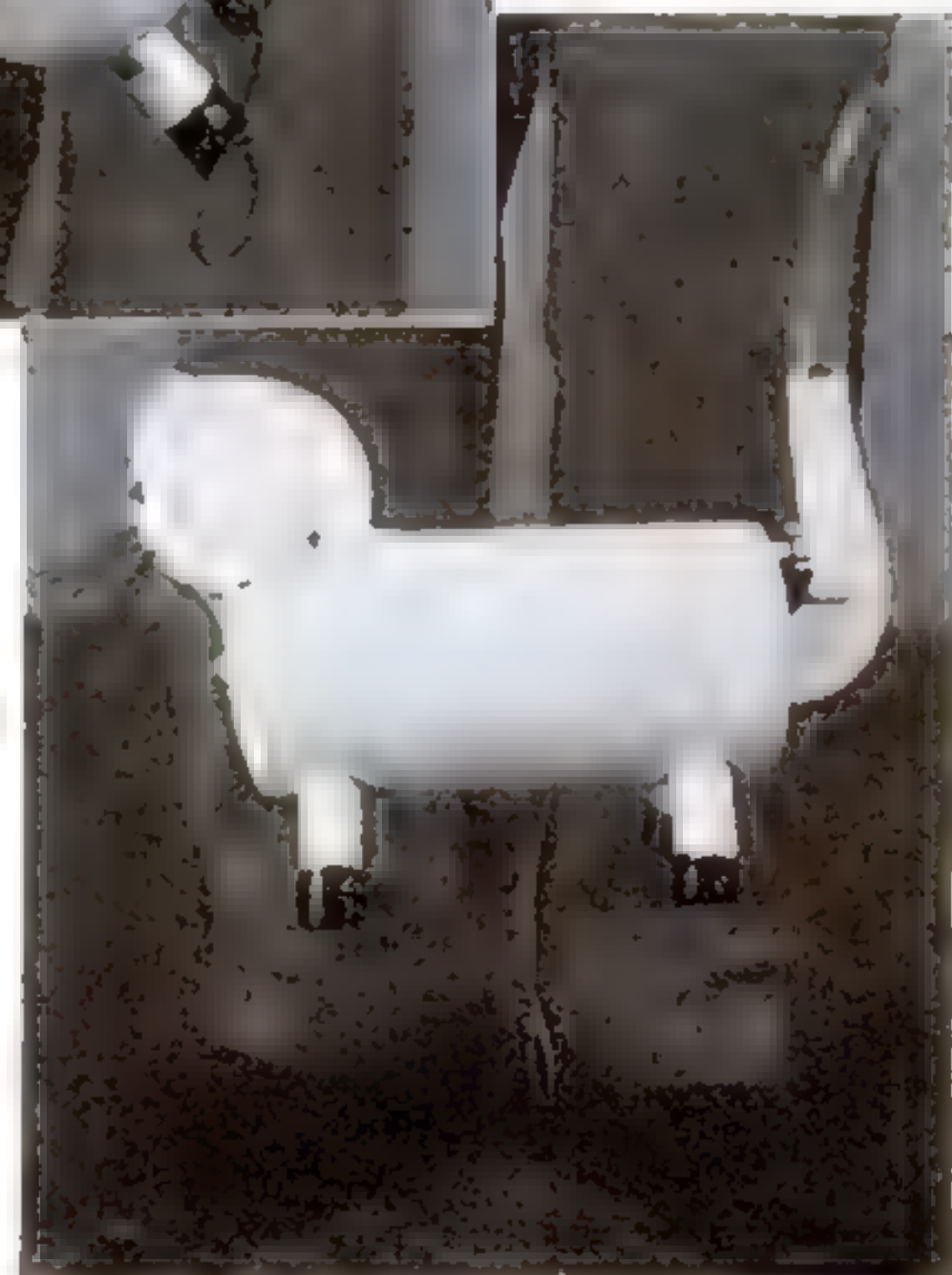
**1** Below, left, setting the dummy wood-and-clay cat for the test. Its tail is turned by a spring action when it is dropped. Its center of gravity and weight distribution are the same as those of a real cat



**2** Upside down, before the test. Releasing the cord to drop the dummy cat starts the action that turns the long wooden tail



**3** Halfway to the floor, above, and the mechanical cat is more than half turned around by the motion of its revolving tail



**5** Happylanding, with all four feet under it and all nine lives still intact, at right. Ordinary rubber cane tips serve as feet to help cushion the shock

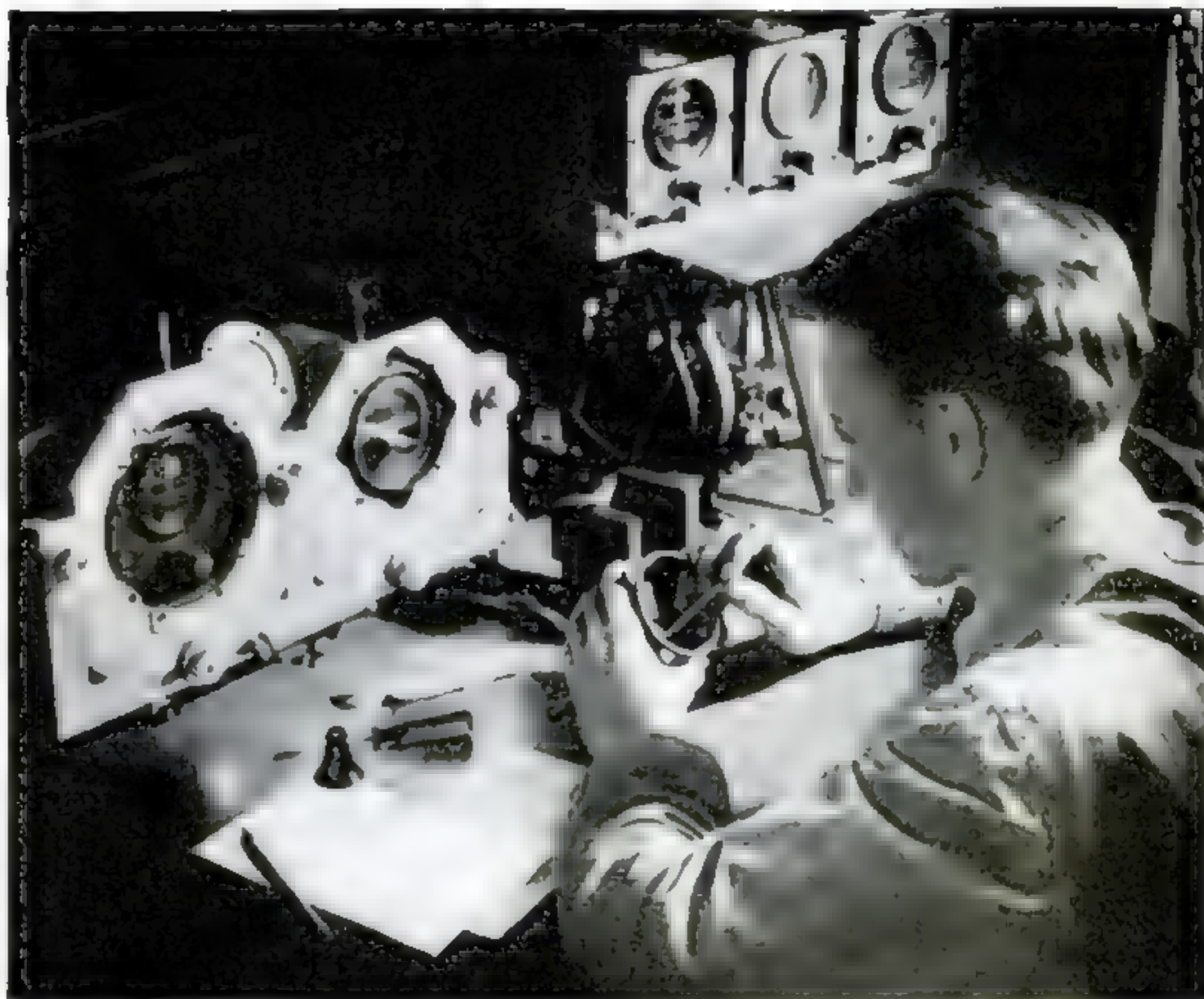


**4** Almost on the floor, and the cat is completely upright. The tail, which automatically stopped turning, has stopped kitty from turning, too



## Instruments Tested in Cleaned Air

TO INSURE the utmost accuracy when checking transport-plane instruments, the Pittsburgh, Pa., testing laboratory of the Pennsylvania Central Airlines has been specially air-conditioned to keep out any traces of moisture as well as dust which might affect altimeters, directional-flight instruments, and other delicate apparatus. Every important instrument in the planes is required to be checked after each 650 hours of use.



Technician overhauling airplane instruments in an air-conditioned laboratory

## Headlight Fits Electric Razor



Razor fitted with housing for light bulb. Left, the illuminated shaver in use



ELECTRIC razors can now be equipped with a headlight that illuminates the area just in front of the cutter, as a New York City firm announces an electric-bulb attachment that will fit most makes. The bulb is shielded in a plastic case that fits against the side of the razor, giving shavers a concentrated light on their faces.

## Ready-Built House Floated Across a River

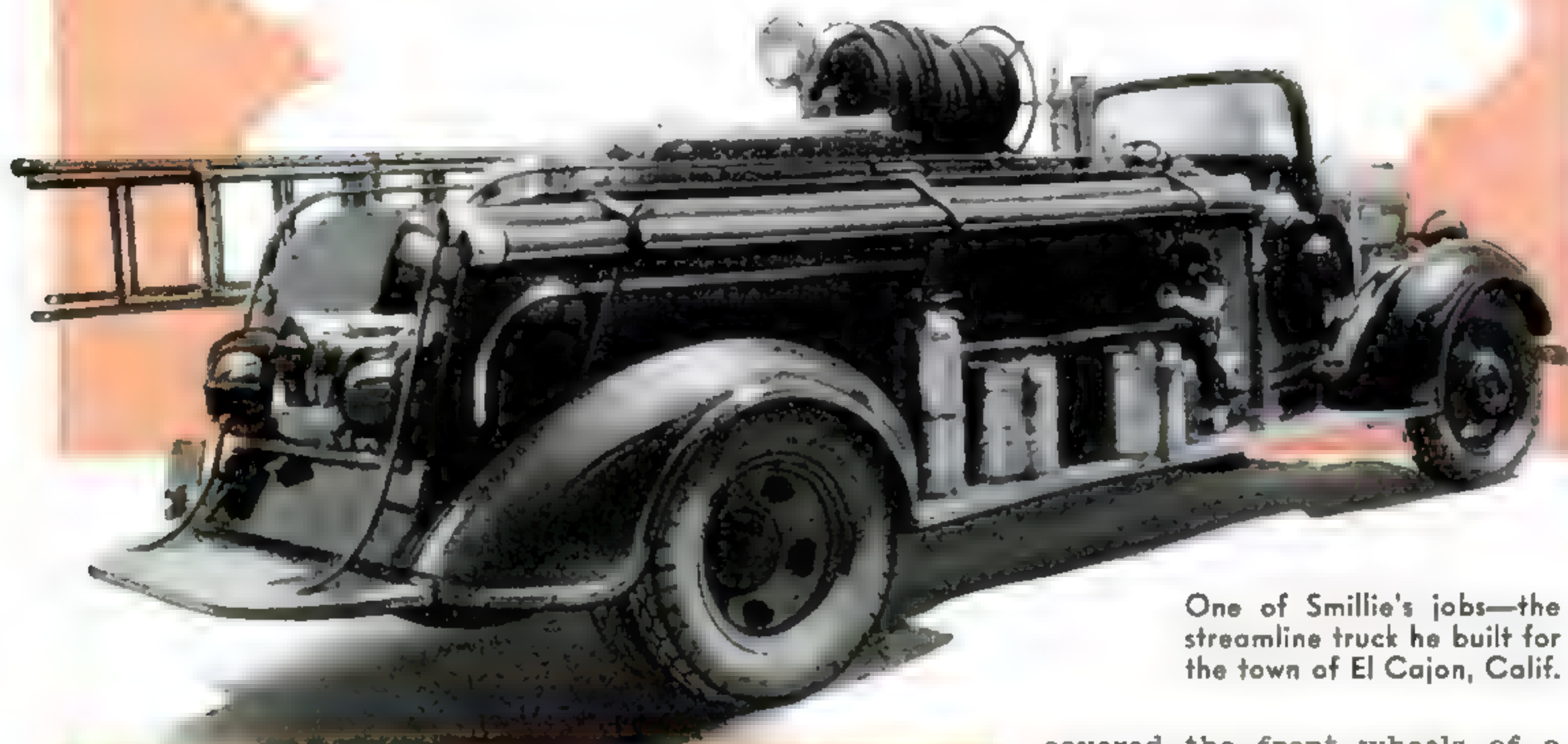
INSTEAD of having his new prefabricated house delivered by truck, a Peoria, Ill., home buyer had the eight-room structure floated across the Illinois River to the building site

on the opposite shore. Drawing only eight inches of water, the forty-one-ton steel building was towed by a power launch as seen in the photograph below.





# He Builds Fire Engines for



One of Smillie's jobs—the streamline truck he built for the town of El Cajon, Calif.



La Mesa, Calif., volunteers fighting a grass fire. Their trim equipment was assembled from spare parts and junk-yard relics

**S**IREN shrieking, a rakish streamline fire engine careers through the streets of a southern California town. It is manned by volunteer firemen. Looking at the flowing lines and gleaming finish of the vehicle, you would never suspect that it was a standard chassis fitted up with spare parts. You would not believe that the sweeping rear fenders had once

covered the front wheels of a commercial truck, or that the siren was a homemade job turned out of a pair of discarded brake drums and an electric starter motor!

Both car and siren are creations of John Smillie, a San Diego metal worker who builds up fire engines for small communities in the Southwest. From such materials as he can buy from junk yards and parts dealers, Smillie turns out fire-fighting equipment rivaling in beauty and efficiency the more costly units seen at fires in every big city.

Most small towns maintain volunteer fire departments. Citizens of all classes band together for the common good, fighting fires without pay. When volunteers in California towns raise funds for new trucks, they often promise subscribers

that Smillie will build the equipment. Recently R. M. Halgren, chief of the La Mesa department, and his eight assistants collected \$1,000 privately, obtained additional money from the town council, and set the truck builder to work. Shortly he delivered a streamline vehicle with the promise, "she'll go faster and unload hose faster than any other in the state."

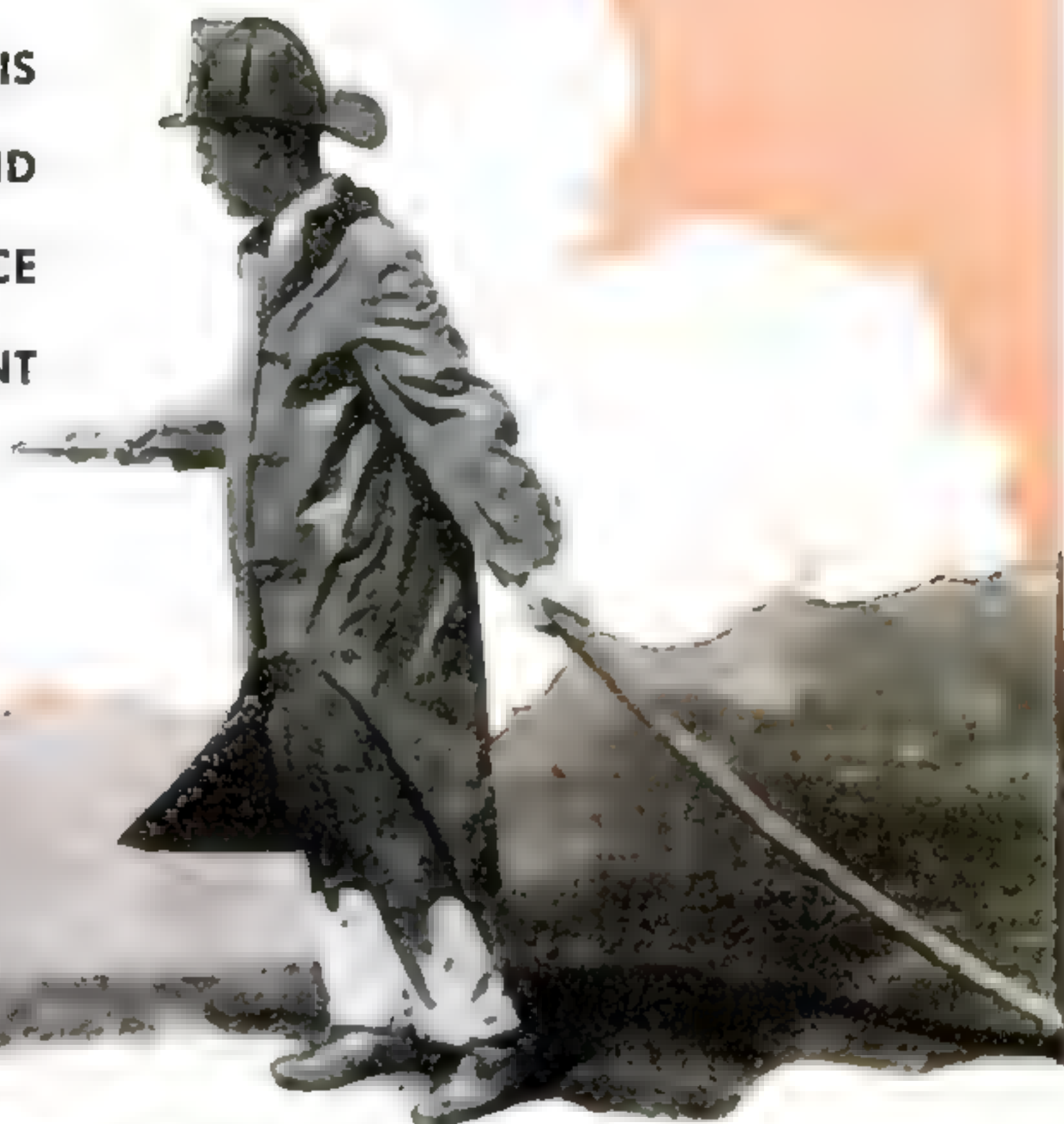


# Volunteer Smoke Eaters

GIVE JOHN SMILLIE A CHASSIS  
AND A FEW SPARE PARTS, AND  
HE TURNS OUT A MODERN PIECE  
OF FIRE-FIGHTING EQUIPMENT

By  
JOHN E. LODGE

A volunteer in action.  
Small-town fire fighting  
calls for good  
equipment at low cost



Halgren determined to test Smillie's promise, and one night, when the truck was standing just outside the town at a grass fire, he sounded the alarm. Forty seconds later one volunteer fireman dashed up to the fire house, within another eight seconds three additional crew members arrived, and within one minute and thirty-five seconds after the siren began to blow all nine firemen, including those on the truck, had answered the call.

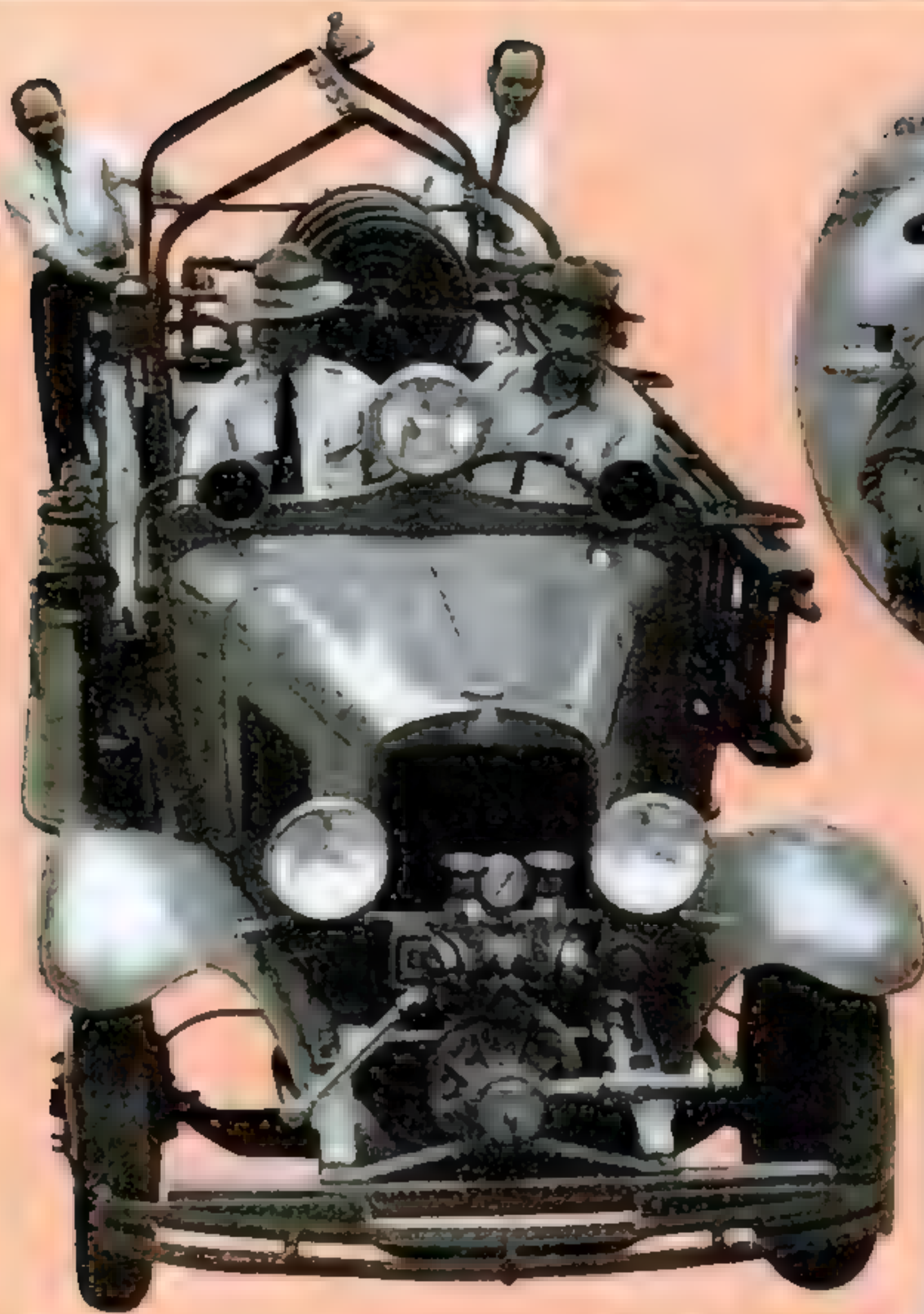
On another occasion, in response to a night alarm, five of the boys answered a fire alarm, reaching the blaze in ninety seconds, and the truck was backed into the fire house eight minutes after it first began to roll. Staggered racks for hose lines, an original design with Smillie, enable the crew to unload hose rapidly.

When a fire marshal visits Smillie's backyard metal shop to leave an order for a new



John Smillie at work on a staggered hose rack, an invention that speeds unloading





Smillie often rides to fires to see how his engines work. Here he is being treated for a burn. At the left, a truck starts out to answer a call

piece of equipment, he usually delivers a chassis and a vague order to "fix her up." From experience, Smillie knows how many gallons of water the truck engine will pump, how much hose the truck should carry, how to arrange ladders and racks and axes for

speedy handling.

He seldom "engineers" a job, but develops it as he goes along. On the La Mesa job, for example, Smillie installed a set of pumps, completed the seats and body, and then found he could not purchase a siren at the price La Mesa's volunteer department expected to pay. In a San Diego junk yard he found two old brake drums. With a hack saw he cut slots through which air could pass under pressure. He cast an aluminum plate to serve as a drive fan and throw air through the slots. Finally, he bought a starter motor for three dollars. The motor turned the plates, which cut the air on and off, thus creating a high-pitched siren at a cost of \$9.50, only one eighth of the price of a new one.

Smillie builds any type of fire-fighting apparatus ordered by his customers. Whenever he reads of a big blaze outside the cities, he anticipates a call for an unusual job. Some time ago, newspapers told of a mysterious fire destroying a railroad tunnel near Carisso Gorge, between Imperial Valley and the Pacific Ocean. Railroad crews had no way to deliver

*(Continued on page 230)*



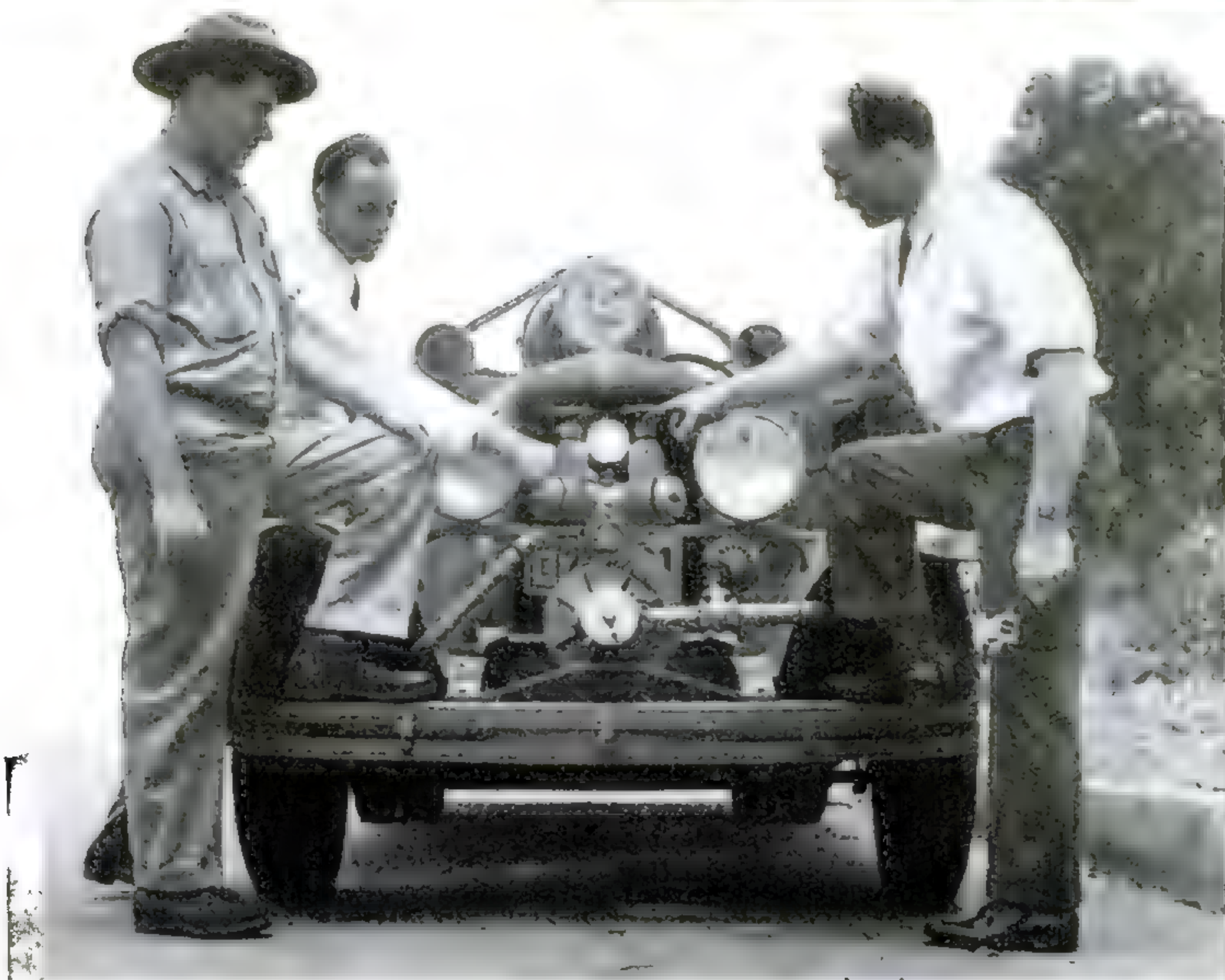
This metal cop, made by Smillie, warns motorists





For trucks to be used in the country, Smillie recommends two pairs of rear wheels fitted with heavy, ridged tires to give traction in wet earth

The homemade siren below was improvised from a pair of discarded brake drums and a starter motor



In rural districts, fire trucks must be powered to suck water from wells and canals. The La Mesa outfit, pictured above, has its pumping arrangement mounted at the front



# DOLLARS FROM SMELLS



**D**EEP in the workings of a western mine, a burly power-hammer operator stopped nudging his chattering rock drill against the face of the drift, and sniffed the air.

"I smell skunk!" he shouted. His voice was drowned in the roar of the pneumatic hammers, but the lights began to blink rapidly, in a series of triple flashes.

His companions looked around and also sniffed the air.

"Fire! Fire!"

With one accord, they dropped their tools and raced to the "skip" leading toward the surface. In the throbbing silence that followed the clatter of the hammers, distant gongs spread an alarm that was carried to all parts of the mine.

Artificial skunk odor now is used in many

large western mines to carry the warning of fire. A few drops of butyl mercaptan, an aromatic fluid produced in the laboratory, are injected into the air-circulating system to create a vapor that is shot through ventilation lines at thousands of feet a second, flashing a silent warning that penetrates where a gong could not be heard. This synthetic smell is one of many recent creations from the test tubes of the "smell experts," chemists who tailor odor-producing materials to fit the needs of industry. Sometimes the desired odor is a delightful perfume, sometimes a harsh stench; more often, it is an aroma skillfully counterfeiting some odor of nature.

Good-smelling paint; fragrant linoleum, ink, and oil; deodorized raincoats, hot-water bottles, oilcloth, and furs—these are some of the smell experts' latest contributions to

**MAKING ODORS TO ORDER, CHEMISTS REPRODUCE NATURE'S  
INNUMERABLE SCENTS, AND EVEN INVENT A FEW NEW ONES**



pleasanter living. A few ounces of a new mixture of aromatic substances may be added to each 100 pounds of raw rubber to offset the natural odor or give a floral perfume. Wall paper now is available in mild, inoffensive odors that give character to the room. Catalogs no longer smell mustily of paper and printer's ink, for synthetic aromatics added in manufacture subtly create a favorable impression of the goods advertised.

Recently, a silverware manufacturer whose business was sliding downhill repackaged his goods in boxes fastened with a pleasantly fragrant glue. As a result, sales rose sharply. It's a tradition that certain fabrics woven in Scotch and Irish mills hold the smell of peat smoke, but American odor specialists were convinced that the smell must be artificial, because there seemed to be no more possibility of acquiring peat smell there than in a Massachusetts factory. They discovered

## By STERLING GLEASON

how to distill dry peat and dissolve the product in deodorized gasoline, producing a liquid that could be sprayed on tweed fabrics to give the familiar odor. Again, a Chicago hotel charmed summer guests by giving its ballroom the invigorating, tangy air of the north woods

through a "carburetor" which dripped pine oil into the air-conditioning system at the rate of a quart every eight hours.

Psychology plays a prominent part in this delicate work. A commercial odor must not only be pleasant, as a rule, but must seem genuine as well. No matter how closely an imitation-leather wallet may resemble the real thing, you'll find it more satisfactory if it actually smells like leather. American buyers seemingly didn't care for imitation Asiatic shawls until chemistry gave the goods an authentic "oriental" odor. One smell expert now is working on the problem of giving a fragrance to ladies' shoes. And when a

complete model coal mine was set up in the Chicago Museum of Science and Industry, the final touch of realism was an earthy smell especially designed for the purpose.

Most synthetic smells are promptly patented, and the discoverer of a new one may earn a substantial fortune. Natural musk, extracted from the glands



A \$10,000 whiff from a large bottle of perfume in a Los Angeles, Calif., laboratory. At right, a chemist testing a new blend. He is sniffing strips of paper dipped into the various essential oils







The osmoscope being used to test the odor left on the breath by a cigar. It shows the strength at which a smell is noticeable

Artificial skunk odor, introduced into the air-circulating system of a coal mine, warns workers of fire when an alarm gong could not be heard



of the musk deer of Tibet, formerly brought as much as \$2,500 an ounce—but chemists learned to produce a synthetic musk that cost but a fraction as much. Such opportunities for profit are stimulating the search for a wide variety of other aromatic substances to meet the specific needs of manufacturers.

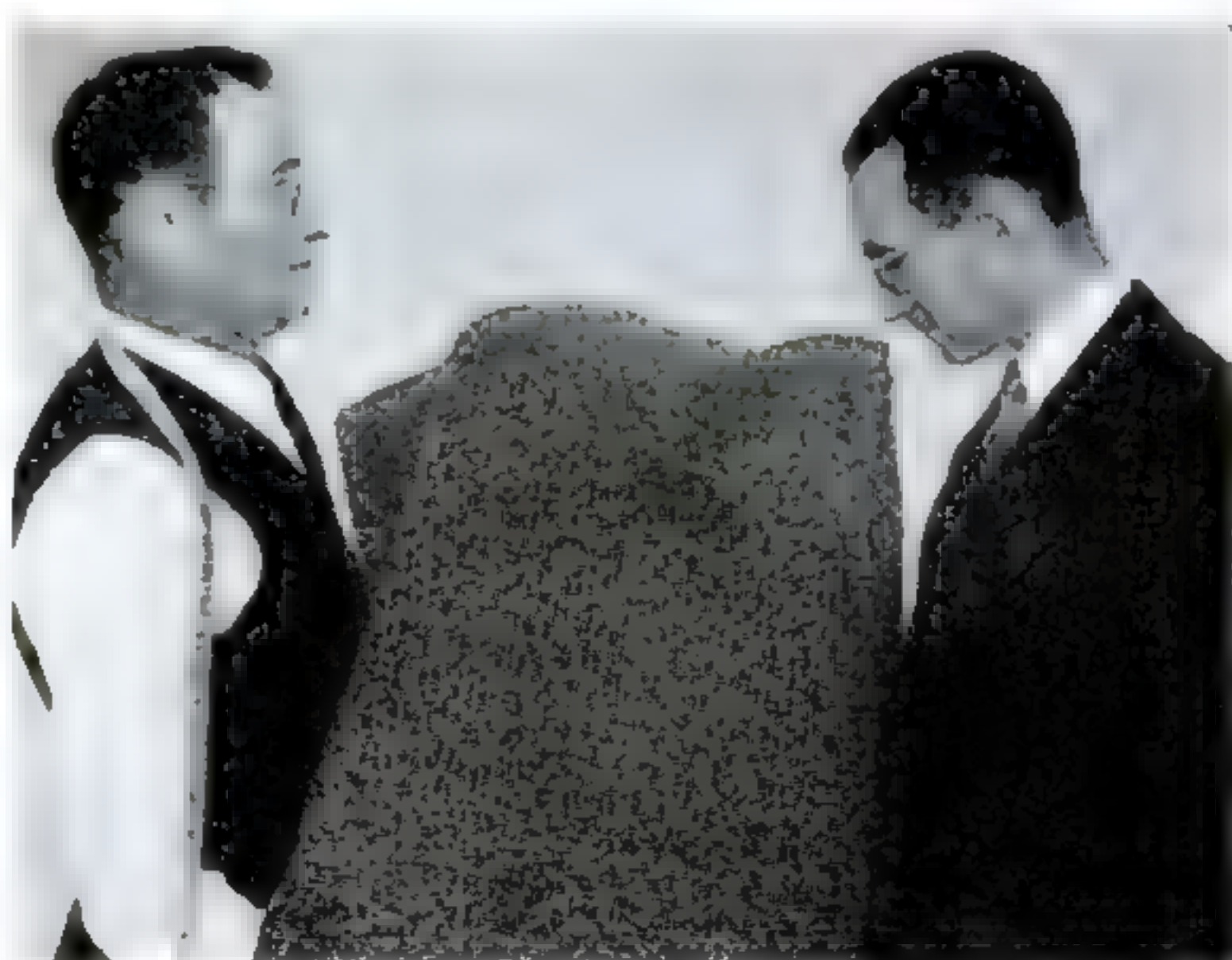
How does a smell expert set out to create a desired odor?

If he is seeking a floral perfume, the problem is relatively simple. "Essential oils," extracted from the flowers themselves, have been used since history began, and these materials simply need to be combined according to the taste of the designer.

Chemists know that noticeable odors are given off only by things possessing a low "surface tension." A good perfume material, therefore, has a weak "skin" which permits vapors to break loose and rise to the nostrils. In blending perfumes, you simply dissolve from one to a dozen known odor-bearing materials in a pure, odorless alcohol, then add a "fixative," a substance which lowers the surface tension and allows the odors to escape freely. Before modern chemistry came to the rescue, fixatives generally used

were musk, civet (from the civet cat), ambergris (produced by sick whales), and castoreum (from beavers).

One by one, these substances, as well as other common perfume ingredients, have been supplanted to a large degree by substances produced in the laboratory. Twenty-



"Peat-smoke" odor, supposed to identify imported tweeds, can be given to any fabric by the use of a spray



five tons of violets formerly were needed to yield a single ounce of violet oil, which chemists now can simulate from oil of lemon grass at relatively small cost. "Carnation" is produced from oil of cloves; "new-mown hay," from the distillation of coal. Even evil-smelling substances such as skatole, actually derived from putrefied animal matter, are used as the basis of some of the very best perfumes. Additional "colors" constantly are being added to the perfumer's palette.

ONE Los Angeles amateur took up the blending of perfume as a hobby, but the fame of his compounds spread so that now he makes a business of creating individual blends to order for Hollywood movie stars. One creation, which he calls the "Flower Lei," represents the fragrance of various native flowers of the Hawaiian Islands.

Perfumes like these, however, are merely mixtures of well-known scents. A smell expert will tell you that "odors mix, but never combine." Certain types of chemical structures are known to be "aromatic"; but predicting exactly how a synthetic material, fresh from the test tube, will smell, is virtually impossible. That means that usually a new odor-producing substance is found only through a long, tedious process of trial and error, perhaps lasting for years.

Such a quest began when chemists of a company distributing natural gas were handed a strange assignment—to give the company's product a characteristic smell.

Contrary to general opinion, pure natural gas, unlike the manufactured variety, is completely odorless. It also is nonpoisonous. You



Natural gas is odorless, but an artificial "gas" smell added to it enables this housewife to locate a leak in a connection

might die of suffocation in a room filled with natural gas, after you had breathed up all the oxygen the air contained, but the gas itself would never harm you. When a gas leak develops, however, there is always danger of fire or explosion. The company wanted to "tag" its gas with an odor that would be unmistakable, as well as free from bad effects when burned. A pleasant odor wouldn't do, for customers might like to smell it and let leaks go unmended. It should suggest gas, too, so that anybody smelling it would get the right idea at once.

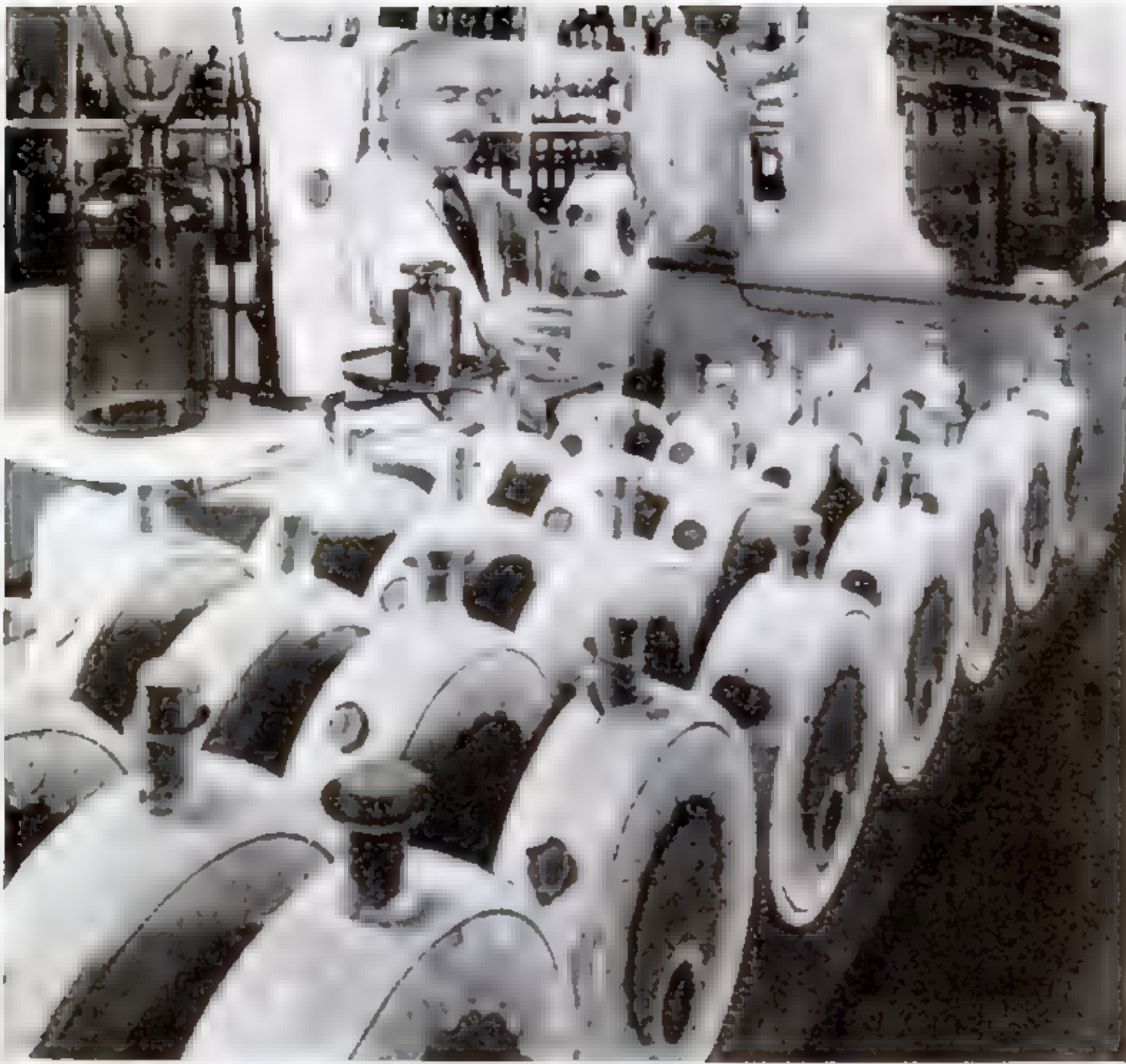
Dozens of complex chemicals were tried before chemists hit upon a suitable material—a harsh, disagreeable-smelling liquid extracted as an impurity from gasoline during refining. When greatly diluted, it has a distinctive odor that instantly suggests a refinery or an oil well. Chemists adjusted its proportions so that it would be detected when the amount of gas escaping into a room reached one percent. Natural gas isn't explosive until the concentration reaches five percent. That meant that the gas could be smelled long before the leak assumed dangerous proportions—even if the smeller had a nose cold, or if cabbage was cooking in the kitchen. The refinery was glad to get rid of this formerly useless by-product, and the gas company now buys it by the tank-car lot, putting some 200 gallons of it into each 100,000,000 cubic feet of gas.

Smell experts often have to be trouble shooters when obnoxious odors create difficulty. Not long ago, residents for several miles around were troubled with a very bad odor originating in a packing house. A chemist traced it to a sewer line where the fumes had condensed in



Buyers like artificial-leather articles that smell like the real thing. The chemists took care of that little detail





These flasks, in a California laboratory, hold a fortune in rose-petal extract imported from Belgium. Sheepskin covers protect the contents in any climate

a small trickle of water. Adding a liberal dose of chlorine quickly cured the trouble. A manufacturer of fish fertilizer was cordially hated in a near-by residential district until he called in an expert who devised a retention chamber in which chlorine gas neutralized the nauseating fumes. Scents from the manufacture of linoleum and oilcloth are particularly offensive. More than one manufacturer has made his employees happier by eliminating odors which formerly would linger in the clothing for twelve to fifteen hours after they went home from work.

In studying an undesirable odor, the smell expert usually wants first to measure its strength. For this purpose, no substitute has ever been found for the sense of smell. "Mechanical noses" of various kinds have been contrived, but all of them require the human nose to identify the odor. The smell expert, however, has one useful auxiliary instrument: the "osmoscope," which consists of a nosepiece attached to a pair of calibrated tubes—one to draw the air from a bottle containing the odor, the other to dilute the odor with pure air. The expert then "trombones" the sliding tubes, sniffing all the while, until he finds the weakest dilution which still has a noticeable smell. Thus he measures the "threshold" strength of the odor, which may range as low as a billionth part of a gram

to every quart of air.

One large tobacco manufacturer, anxious to show the superiority of a nationally known brand of cigars, had a smell expert collect the breath of men after they had smoked various kinds of cigars. With the osmoscope, he measured the amount of odor that remained, and was able to demonstrate scientifically that his brand left the least "after-breath."

Biggest smell-eliminating job of today is the problem of taking the odors out of "conditioned" air. Most air-conditioning systems "recirculate" the air again and again and the accumulated odors grow in strength until they become obnoxious. Dr. Philip Drinker of the Harvard School of Public Health, classifies the three most common as foodstuffs (comparable to hydrogen sulphide, the "rotten-egg" gas), human smells (people needing baths—similar to butyric acid, found in rancid butter), and tobacco smoke. All are extremely persistent and can be detected when present only as a few parts in 1,000,000,000 parts of air.

They can all be eliminated to some extent by absorption in a cold liquid such as cold water or brine, thus dissolving out the soluble gases; by diluting with clean air until they are too faint to be detected; by filtering through charcoal or activated carbon; or by oxidation—literally burning up impurities with ozone.

**P**ROF. John Madigan, of St. Thomas College, worried by poor marks being made in his physics class, hit upon a chemical grading system for examination papers. He put them into three jars; sprinkled the best group with attar of roses, the poor ones with hydrogen sulphide, and the failures with butyric acid; then invited students to pick out their papers.

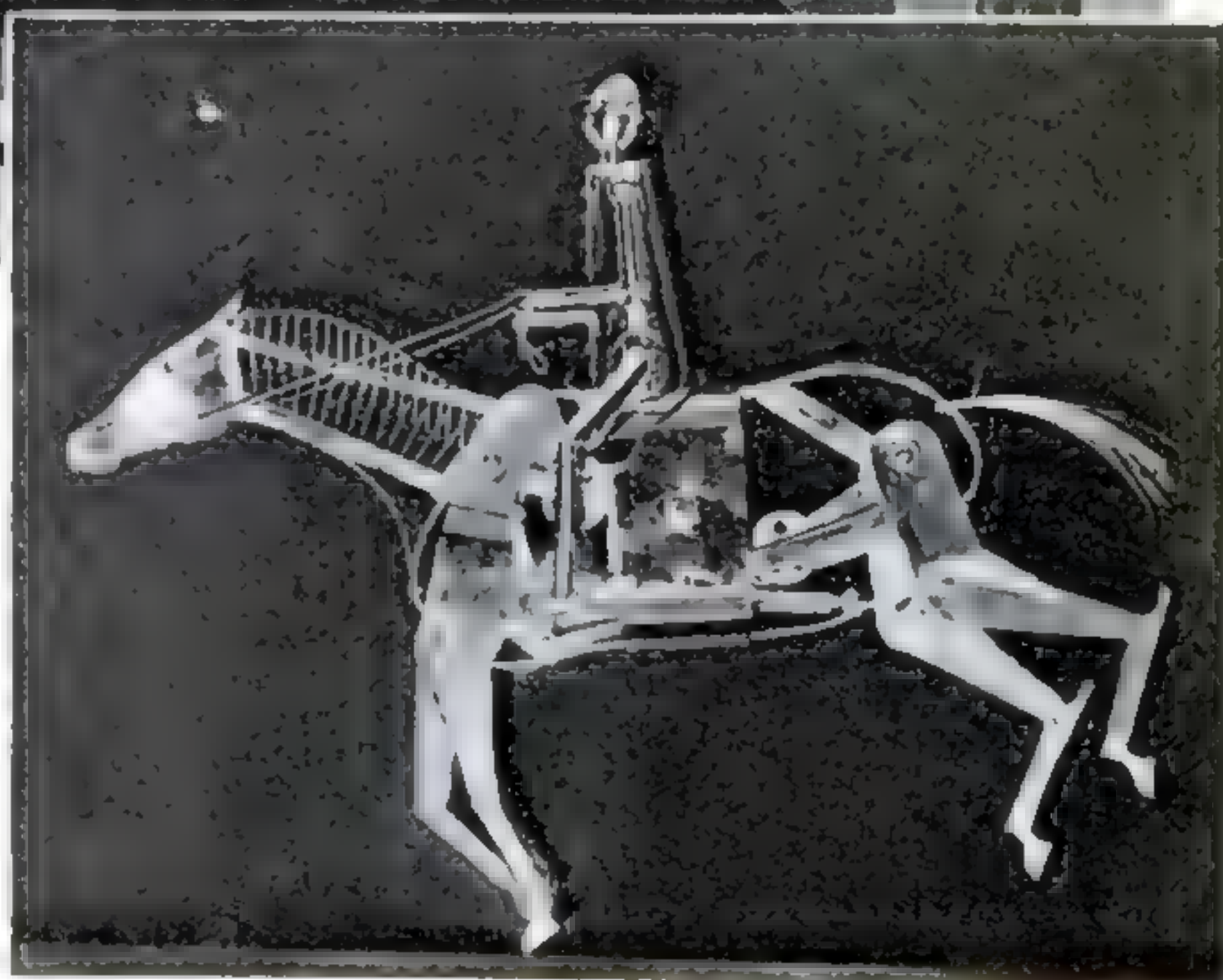
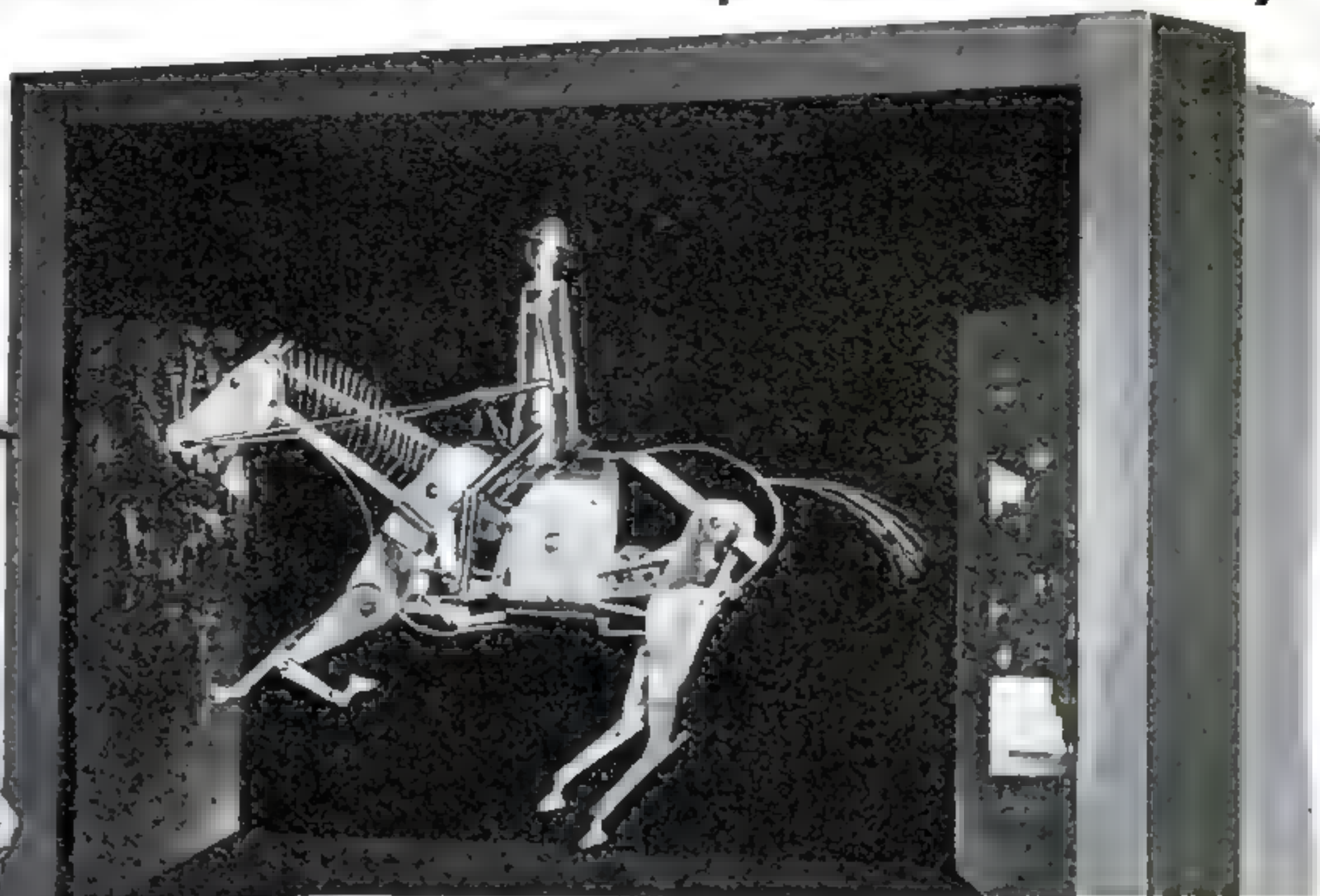
"It wasn't necessary to tell them whether they had passing grades," commented the professor. "They 'sensed' that."

Result of the unique grading system was a thirty-percent average improvement on the next examination.

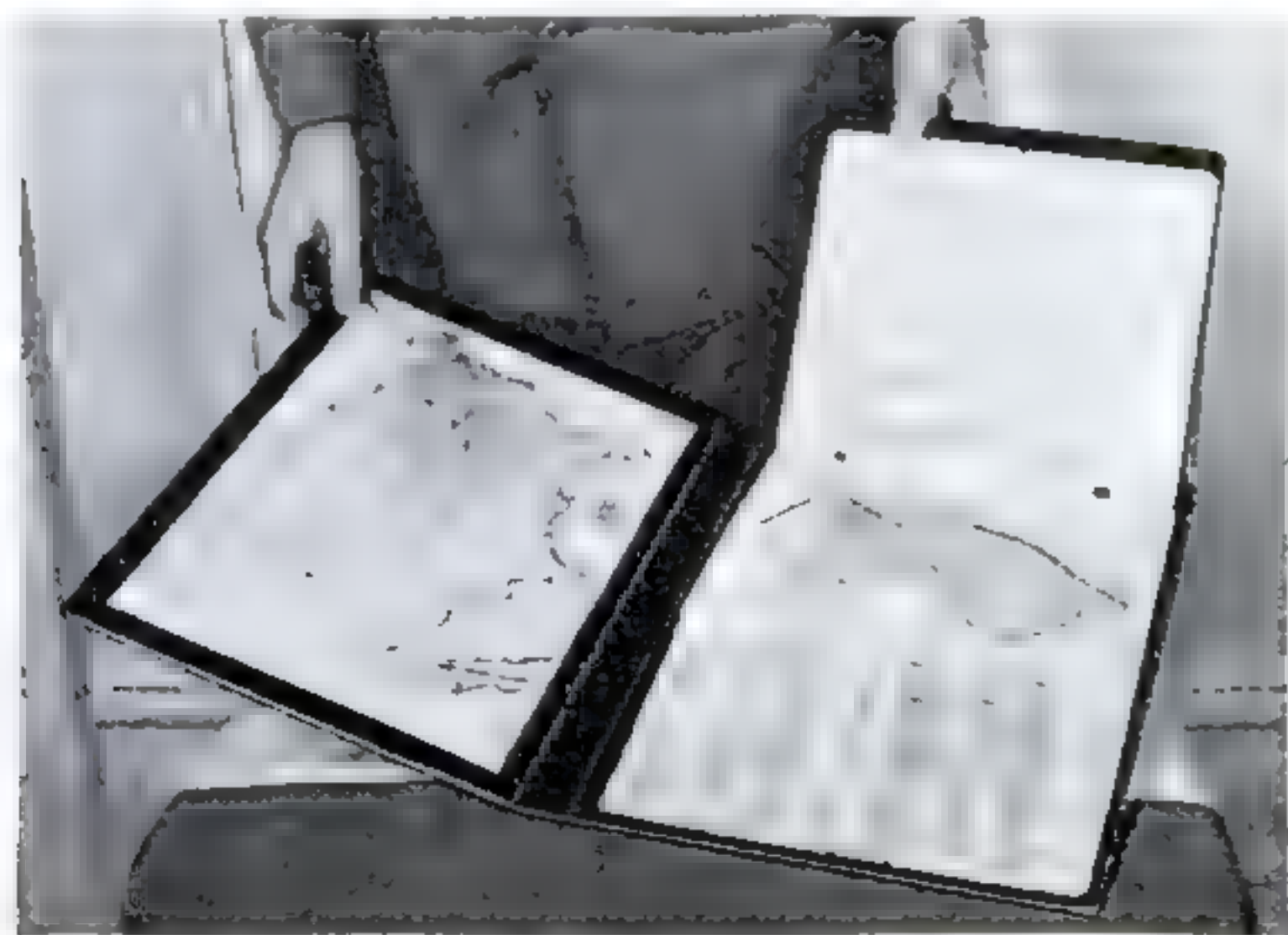


# Mechanical Horse Gallops Realistically

G. H. Messmore throwing the switch that starts the streamline horse. Mirrors give front and back views



**T**O SERVE as a symbol of "horsepower" for an exhibit at the New York World's Fair, Messmore and Damon of New York City, famous makers of animated exhibition models (P.S.M., June '32, p. 16), have completed a streamline, mechanical horse whose lifelike galloping action is said to have amazed experts. An intricate composite of chromium-plated metal parts, the symbolic steed is flanked by mirrors which give front and back views.



## Visible Index on Atlas Locates Maps Quickly

**H**ANDY for students, research technicians, and office workers is a new loose-leaf atlas of the United States equipped with a visible index making it easy to find the map and statistics of any state. The atlas cover, hinged at the left, opens to reveal a map of the nation on the inside, while state maps are printed on pages hinged at the top, at the right. Because the complete United States map is visible at all times, regardless of which state map is being used, comparisons can be made easily, without turning a page.

Each map page in the atlas has a tab for ready reference



# Make-Believe Crimes

**J**UST as an army holds war games, the police department of Pasadena, Calif., now holds "crime games" to train officers in the use of science in their search for clues. Mock murders, make-believe suicides, counterfeit hit-and-run accidents, keep the detectives on their toes. Several times a month, they answer emergency calls and find synthetic crimes awaiting solution. Only by employing the latest scientific methods of detection are they able to discover vital clues.

During the two years that this unusual system of instruction has been in operation, every active member of the force has been trained as a scientific sleuth. And, what is more important, the list of unsolved crimes in Pasadena has been cut almost to the vanishing point.

Here is a typical leaf from the exciting "text-



**Suicide—or murder?**  
The only clues are a gun and an empty shell



A little dirt in the shell case supplies the answer for this problem presented to cops by the Pasadena, Calif., crime school

Answering the radio call, detectives and motor-cycle policemen rope off the "crime" car and hunt for telltale evidence



Police Photographer F. O. Gould, at left, sets up his camera and snaps the scene from various angles





# Train Scientific Sleuths

book" studied by these western crime fighters:

It is mid-afternoon. From police headquarters, radio flashes the following message: "Calling cars 23 and 24. Dead man in automobile near road camp on Arroyo Seco. Motor cycles 7 and 8 proceed for assistance."

Detectives and police officers race to the crime scene. Motor-cycle officers arrive a moment later. Under the sheltering branches of an oak tree, they find—not a corpse, but a trusty from the city jail. He is slumped over the wheel of a car as in death. Near-by stands Police Photographer Fletcher O. Gould, his camera trained through the open door on the prisoner.

The cars pull up to form a triangle with the death automobile. Four officers quickly string ropes around the cars and near-by trees, and motor-cycle cops take up positions to keep out the gath-

ering crowd. The detectives examine the "victim," and direct a search for physical evidence. The exterior of the car is checked for fingerprints, and Gould takes photographs of the entire scene, including close-ups.

On the seat near the prisoner's right hand an automatic pistol and an empty shell case are found. The floor is free of dirt, and in a pocket is found a suicide note. Holding the pistol with two fingers, one of the detectives transfers it to a transparent envelope. He picks up the shell, turns it over carefully in his hand. From it falls a small amount of dirt.

By

ARTHUR A. STUART



Make-believe murder. A detective sets the stage for an imaginary mystery by acting out the supposed crime, leaving clues for the police students to unravel

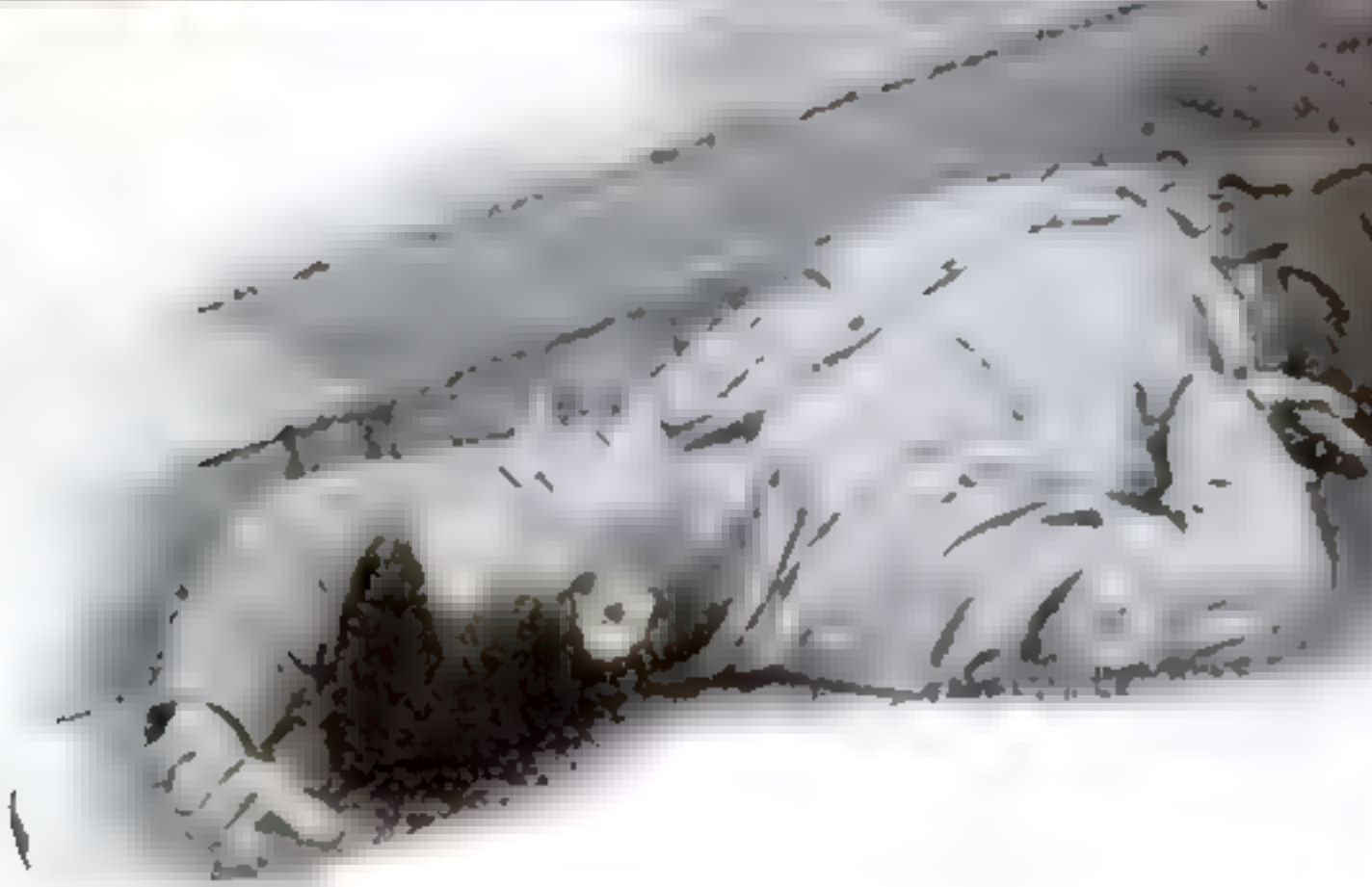
This is what the police find when they reach the scene. On the surface, it looks like a suicide

At the left, an investigator is carefully placing the "death gun" in a transparent bag to preserve fingerprints. Close observation and scientific sleuthing provide the correct answer—"murder"





Traps for the hit-and-run driver. At left, Pasadena Police Physicist Wm. W. Harper shows how to take scrapings of paint from fenders to match with trace found



A police officer measuring the location of a "body." He learns to look for clues like headlamp glass in a trouser cuff, at right



"Diagnosis homicide," he reports to headquarters that afternoon. "Shell case on seat of car contained small trace of sand corresponding to that found around car. Shell carelessly placed in car to support a suicide picture."

Pasadena, like many cities, was suffering two years ago from too many unsolved crimes. Hit-and-run drivers escaped arrest. Apparent suicides may have been murder victims. Police physicists and chemists worked wonders with the scant evidence brought in, but Chief Charles H. Kelly knew laboratory findings were no more complete than the evidence found at the scene of the crime. He called in Chief of Detectives Stanley Decker and Police Physicist William W. Harper. "Microscopes and laboratory examinations are not enough," he told them. "Police officers themselves must go scientific. I want each officer on our force to know how new laboratory equipment affects his work."

From that conference came Pasadena's unusual crime school. It is not only a classroom study of books. Officers respond to radio calls, never knowing whether they are rushing to the scene of a real crime or will find

some trusty, or perhaps a dummy, the cause of whose "death" they must determine from clues that they can find.

A radio flash sent plain-clothes men to a downtown office building. There they found a trusty slumped toward a typewriter on a small table, his back against a roll-top desk. Near-by stood Chief Decker, who directs the school.

"What is it this time, boys?" he grinned. "Suicide?"

Without answering, the detectives began their investigation.

"We stipulate," Decker went on, "wound in right forehead with considerable hemorrhage, and another wound in rear of head with slight bleeding. No powder marks are visible."

An hour later, the officers handed Decker their reports. "Circular traces of blood indicate man had been revolved in chair after being shot," they found. "Nature of bleeding from both wounds showing bullet entered



from rear. Automatic was found unloaded and slide not back, indicating it was closed manually after being fired." Each officer correctly diagnosed the "crime" as murder.

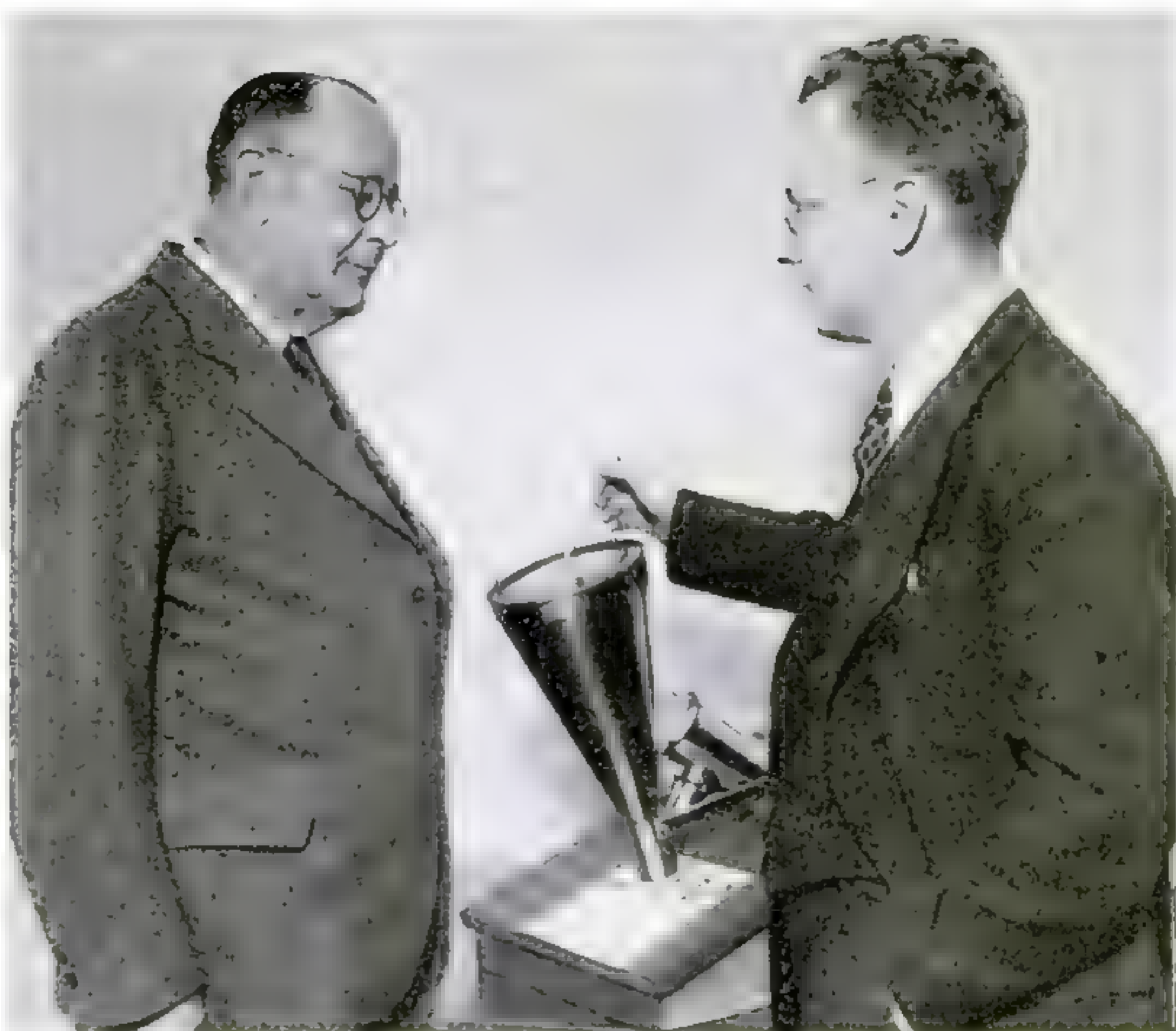
Several motor-cycle officers were rushed to a point below Pasadena's famous "suicide bridge" the other day. "Looks like he jumped, boys," said the radio dispatcher. They roped off the area around the "body" and made the usual photographs and measurements. Then one noticed several small, green leaves adhering to one elbow. No such leaves were growing nearby. Another officer detected a small piece of broken headlamp glass tucked away in a trouser cuff.

"This guy didn't jump," they unanimously decided. "Some driver hit him, brought him here, and ran."

Little things—blood, hair, glass, dirt—often prove the deciding factors in diagnosing a crime. Not long ago, a staged accident brought four policemen to a dark street. This time they found a dummy lying outside a car, which was jammed against a telephone pole.



Shattered glass teaches officers how to determine from which side of a windowpane a bullet was fired



Chief Charles H. Kelley examining the dactyloscope, a magnifying projector used by students of the Pasadena police school for identifying fingerprints

It looked like a crash in which the driver had died. But they were not satisfied. Exploring the car minutely, inside and out, they discovered two red hairs stuck to the window in the left door with red wax. The dummy had black hair.

"Manslaughter, not accident," they decided. The theoretical driver of the car, injured when he struck the glass, had fled.

Five days later, the same group of officers received a hurry-up call to the scene of a real accident. There they found two boys and a girl, all injured. There followed the usual crime-school investigation, which revealed three hairs from the youth sitting on the right side, stuck in a blood clot on the jagged edge of the broken windshield. Later, when the other boy, whose head was uninjured, denied having been at the wheel, photographs of the hair and his friend's cut head induced him to confess.

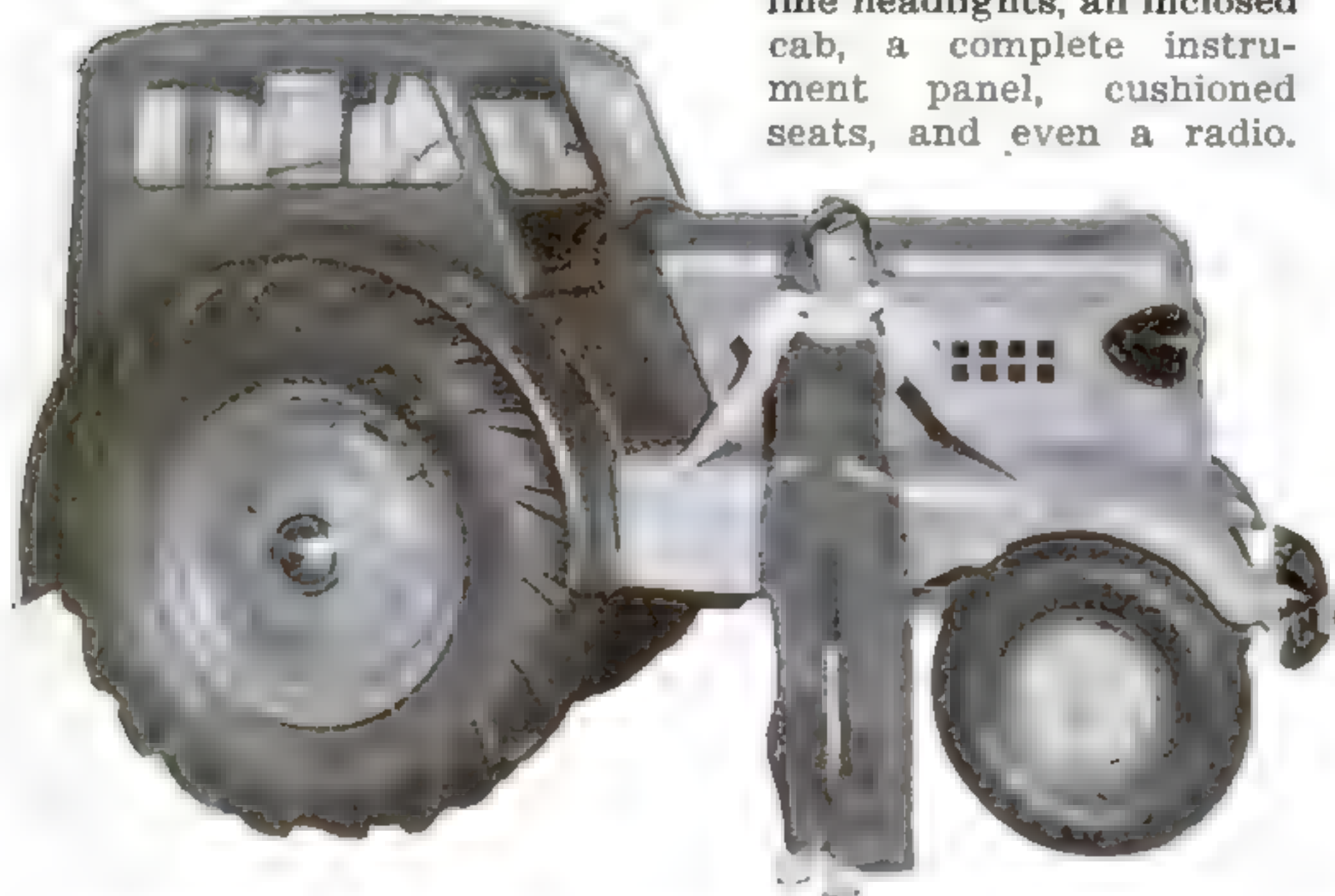
"If you pull a crime in our town," says Chief Kelley, "you stand a better-than-average chance of being caught and convicted. We will back up all our charges against you with proof. Hairs from your head, a broken lamp from a headlight, fabric from your coat, fingerprints. If you are guilty, we will connect you with the crime so clearly that no one else could conceivably be the culprit."

One proof of the crime school's success lies in Pasadena's record of hit-and-run convictions. Only one case is unsolved.



## Big Farm Tractors Go Modern

**P**LOWING should be sheer luxury to farmers who own a tractor now being manufactured with most of the comforts, conveniences, and accessories of a modern passenger car. Fitted with giant, rubber-tired rear wheels and a powerful high-compression engine, the tractor boasts of streamline headlights, an inclosed cab, a complete instrument panel, cushioned seats, and even a radio.



### Novel Desk Phone Has Pull-Out Dial

**D**ESIGNED for desk use, a new English hand telephone fastens within the knee space of a desk, out of the way. The dial is pulled out into full view when calls are made.

## Bicycle Drives Gas Pump When Power Fails

**W**HEN a storm cut off the power supply, Bobby Harrington, a Somerville, Mass., boy, helped to solve the problem of how to get gasoline from an electric service-station pump. As

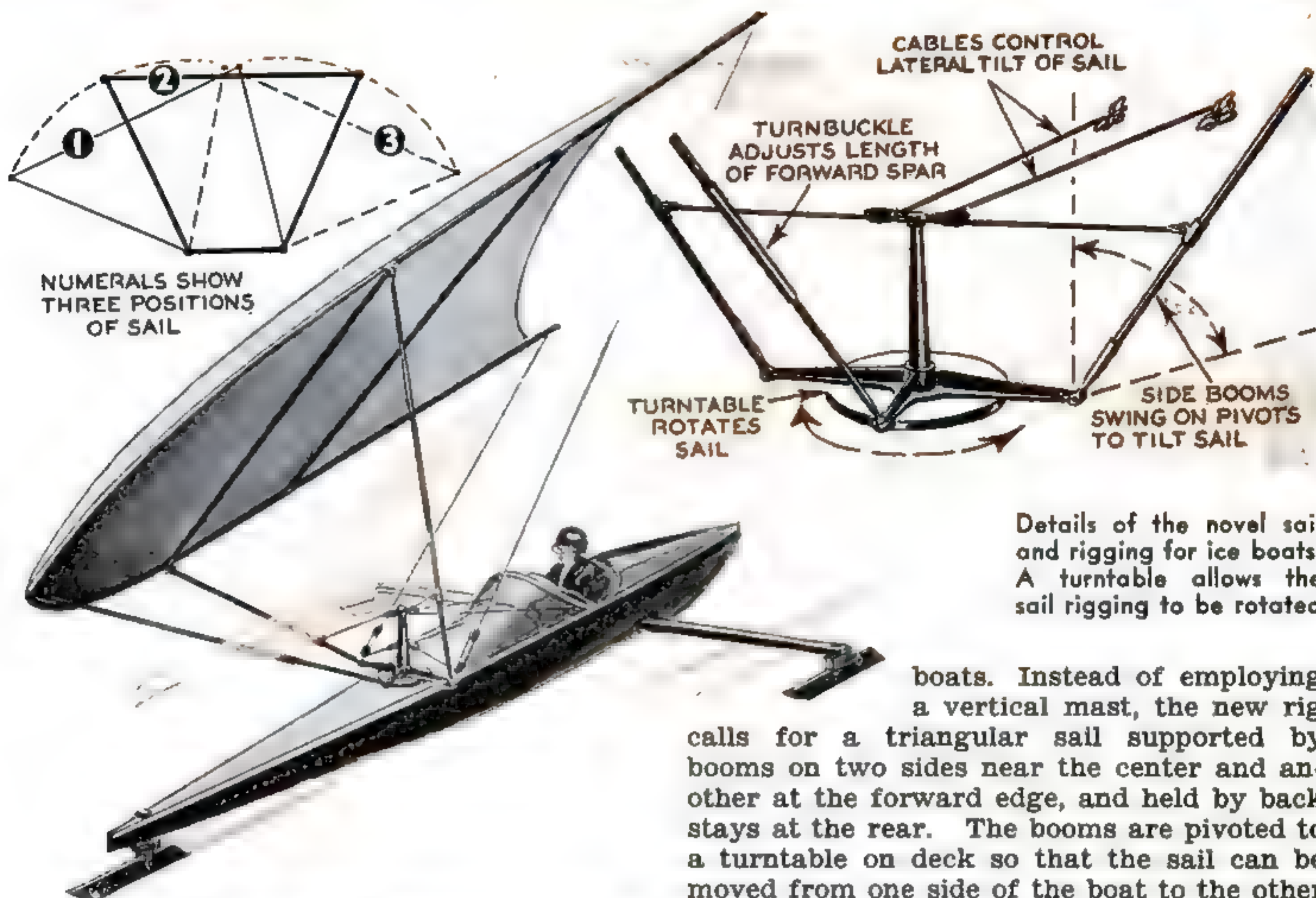
shown below, he turned his bicycle upside down, removed the rear tire, and installed a clothesline driving belt between the wheel rim and the pumping mechanism.



A boy's bike supplied power for this service station's gasoline pumps after a storm cut off the electricity



# Ice Boats Get New Speed with Odd Rig

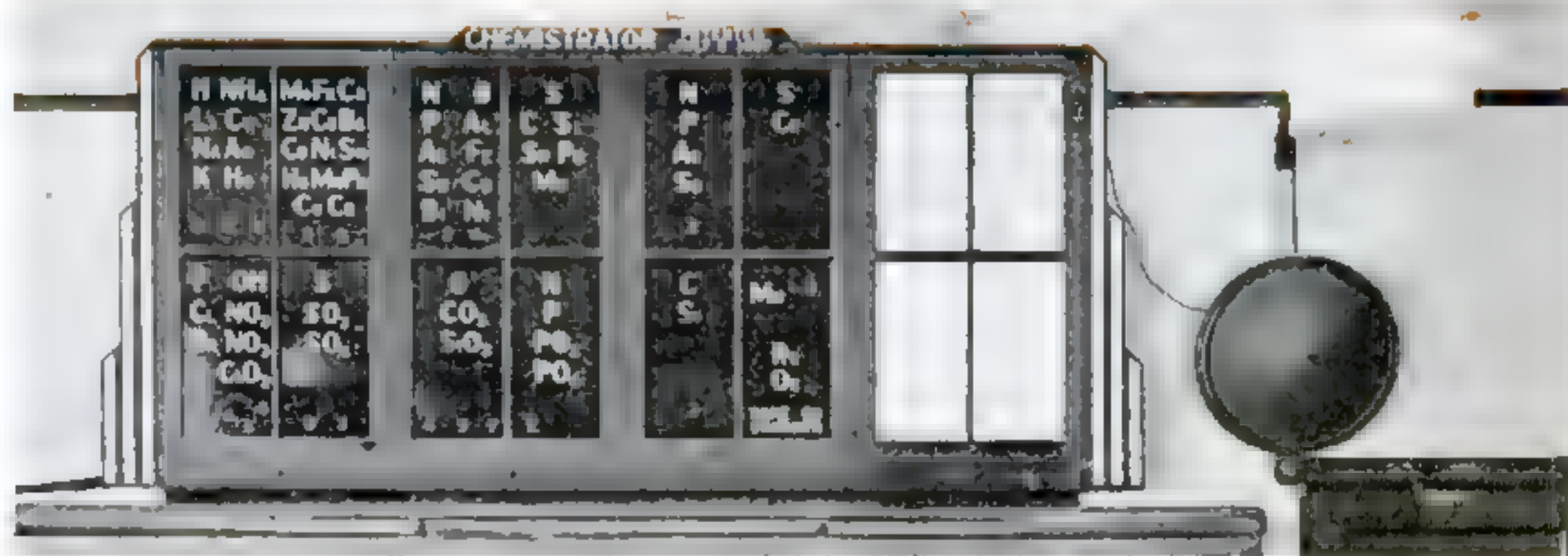


Details of the novel sail and rigging for ice boats. A turntable allows the sail rigging to be rotated

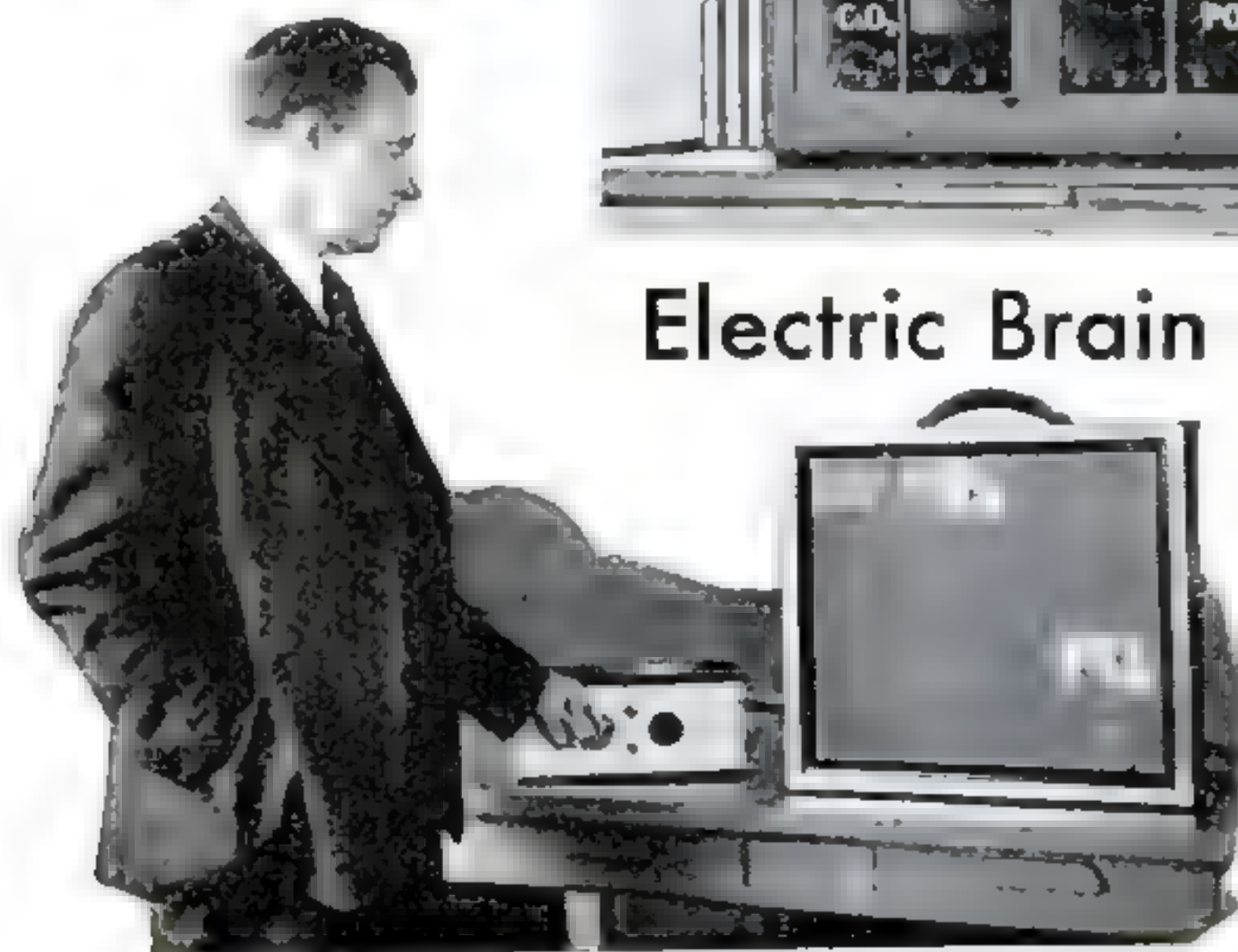
**A**LTHOUGH designed principally for use on sailboats, an ingenious sail rigging devised by a Californian also provides exceptional stability and maneuverability for ice

boats. Instead of employing a vertical mast, the new rig calls for a triangular sail supported by booms on two sides near the center and another at the forward edge, and held by back stays at the rear. The booms are pivoted to a turntable on deck so that the sail can be moved from one side of the boat to the other when changing course. The turntable is controlled by a tiller wheel, while a cable-and-pulley arrangement is used to adjust the sail laterally to catch the wind.

The mechanical formulator which tells how chemical elements combine. At the right is a classroom installation, and below is a small demonstration model



## Electric Brain Gives Chemical Formulas



**A**N ELECTRIC "brain" automatically produces the formulas of familiar chemical compounds, in a new educational aid for schools and colleges designed by H. S. Van Doren of Great Neck, N.Y. Turning a knob on the control panel of the device "mixes" any desired pair of ingredients. Relays light up the corresponding chemical symbols, together with numerals that show their proportion in the resulting compound.





## Manikin Illustrates How Radium Fights Cancer

**D**ESIGNED by scientists at the University of California, a giant bas-relief figure of a man will show visitors to the San Francisco world's fair how radioactive substances are used in the control and treatment of

cancer. Pressing a button will send vari-colored spheres representing radioactive substances down a tube into the manikin's body, and printed legends will appear simultaneously to describe the effect on various areas.



## Lifted Three Miles by Balloon, Glider Drops at 100-Mile Clip

RUSSIAN aviators recently made history by a daring balloon-glider combination flight into the stratosphere near Moscow. With the glider suspended beneath it, a balloon took off, soared to an altitude of over 16,000 feet within three quarters of an hour, and then released the glider which was guided down to a landing by its pilot at a speed of 100 miles an hour. Aviation authorities regard this feat as a demonstration of the practicability of using gliders for emergency descents in stratosphere-balloon ascensions.

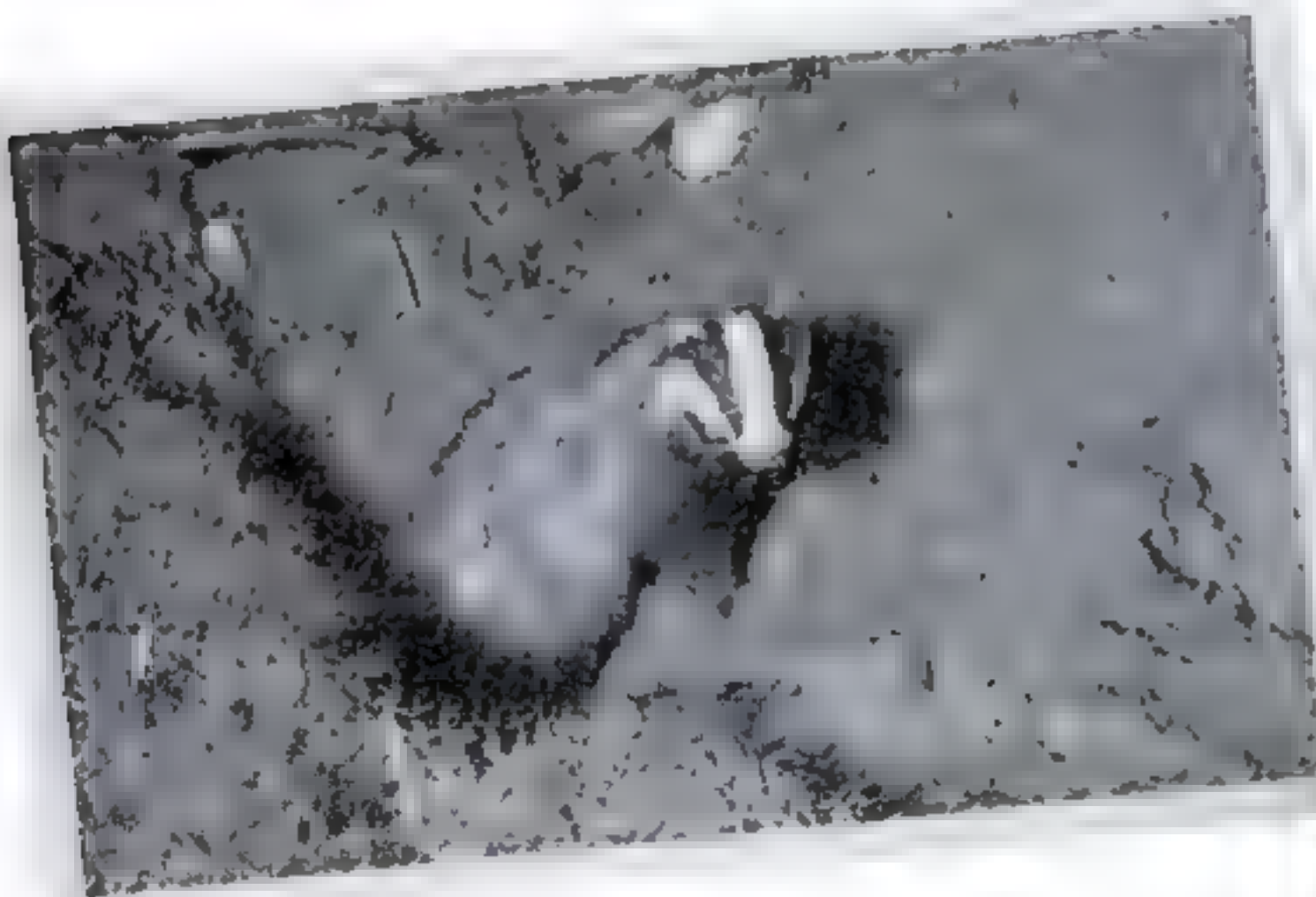
## Humidifier Fits Cigarette Pack

COMPRESSED under tremendous pressure, blocks of a mineral substance encased in small cellulose tubes are now available as compact tobacco moisteners that fit in humidors, pouches, and cigarette packages. Kept damp by a tiny built-in water reservoir, the small mineral block releases water vapor, no actual liquid being freed at any time.



The balloon-glider shortly after the take-off

## Flash Bulb on Hat Leaves Cameraman's Hands Free



FOR snapping night photographs of badgers and other wild life the ingenious photographer pictured at the right rigged up his small-size flash bulb and reflector on the top of a military trench helmet worn on his head, leaving his hands free. The flash bulb is synchronized with the camera shutter.



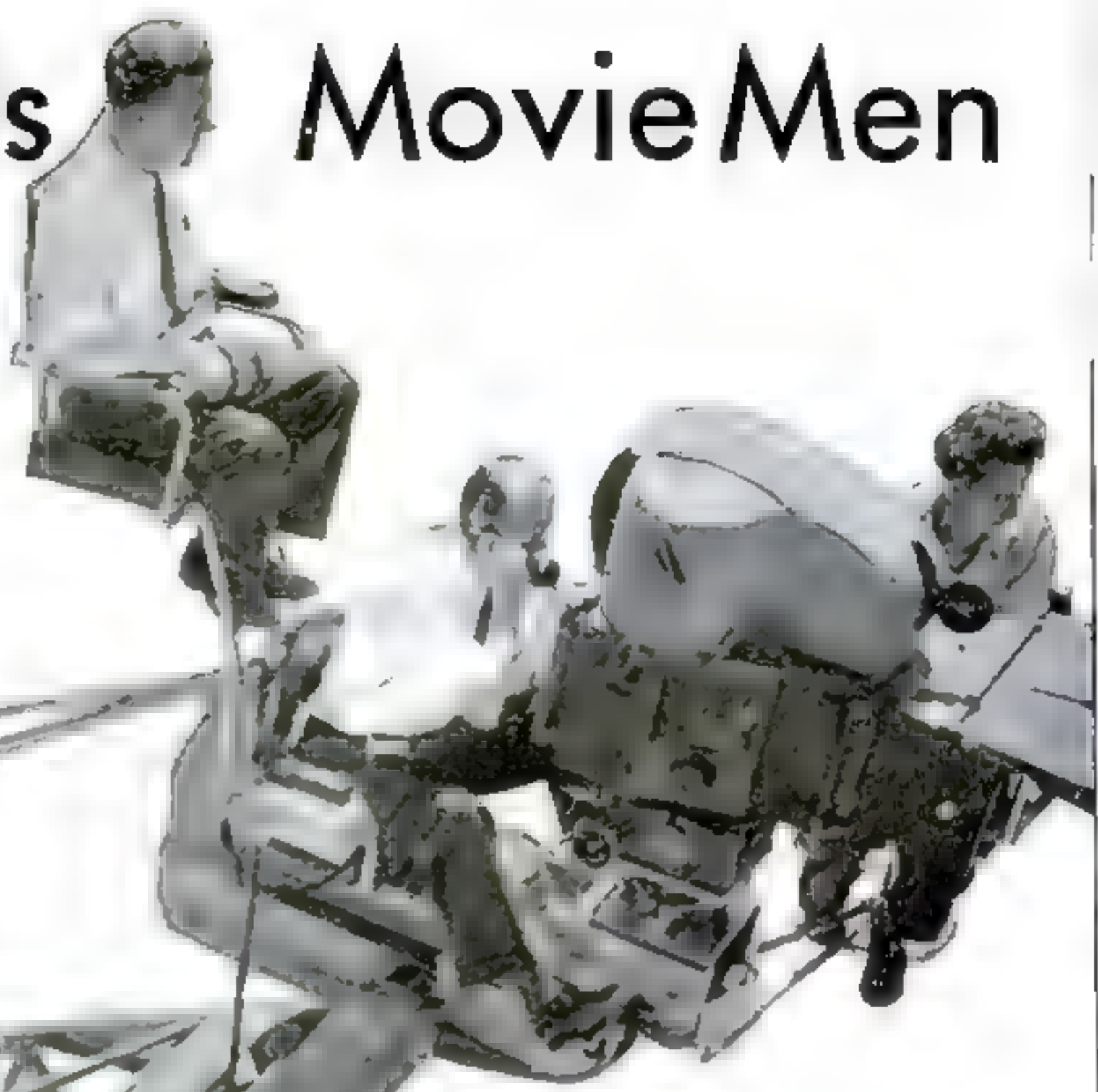
With his flash-bulb reflector atop his hat, the photographer's hands were free to take picture at left



# Mobile Crane Aids Movie Men

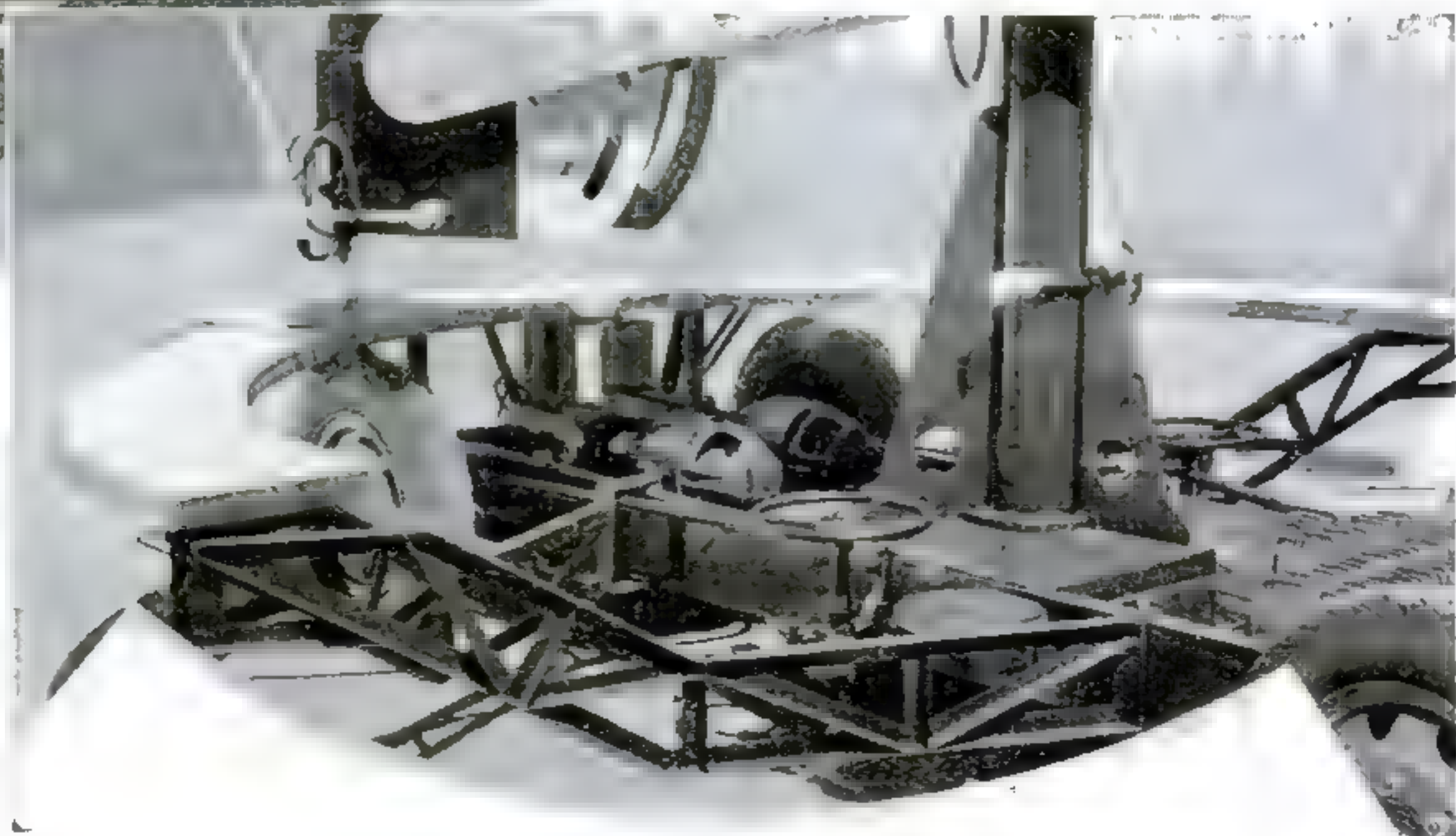
## Electric Motors Maneuver Giant Camera Boom

From this turntable boom, cameramen can shoot movie scenes from any angle, as desired



**S**OARING over props and furniture, following an actor up or down stairs, whirling around in a complete circle—these are some of the unusual things that can be done with movie cameras mounted on a new lightweight camera crane invented by E. H. Heyer and E. L. Fischer, of Hollywood, Calif. Constructed of duralumin and powered by two electric motors, the crane has a turntable base mounted on a rubber-tired truck chassis. The camera support at the tip of the swinging metal boom of the apparatus is so hinged that the camera can remain constantly pointed at its objective, even while it is being moved forward, backward, sideways, up,

Electric motors drive the odd vehicle, which is mounted on sturdy truck wheels. Note the boom's counterweight at the right







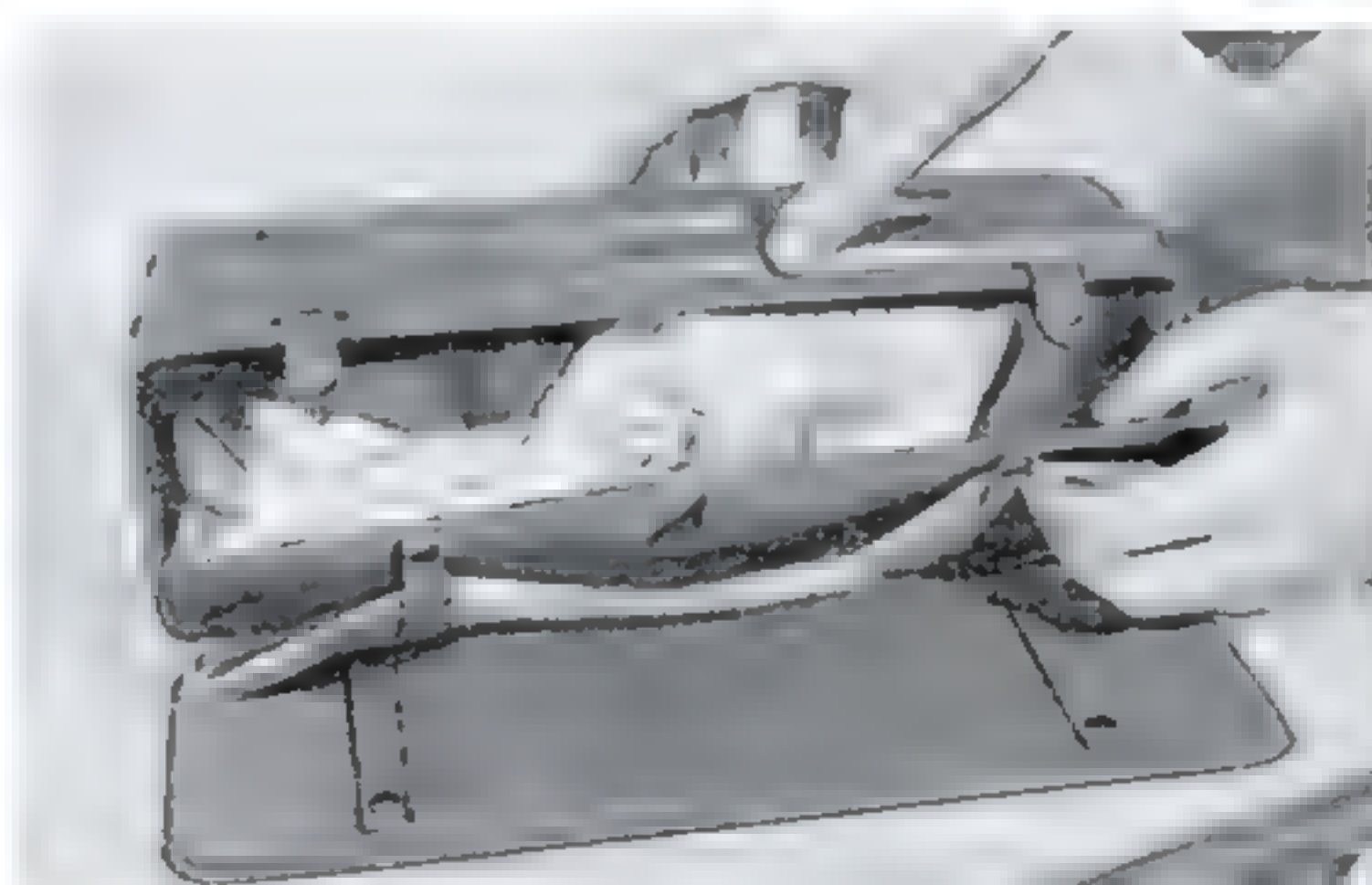
A pivoted chair that can be swung out in front of the camera simplifies the making of lens adjustments

or down, thus permitting many new and unusual camera shots to be made. From his perch on the end of the girder boom, the cameraman can control, by means of conveniently situated pedals, every movement of the crane, or it may be controlled automatically by first setting an operating mechanism. A combination drum and pointer needle located near the base of the boom

makes a continuous record of the camera's movements so that the operators may repeat the same motions of the camera when retaking a particular scene. The two electric driving motors that power the apparatus can drive it forward or backward at speeds ranging from a snail's pace to twelve miles an hour, while the crane lifts a camera and its operators twenty-five feet in the air.

## Traveling Kit Has Space for Ties and Socks

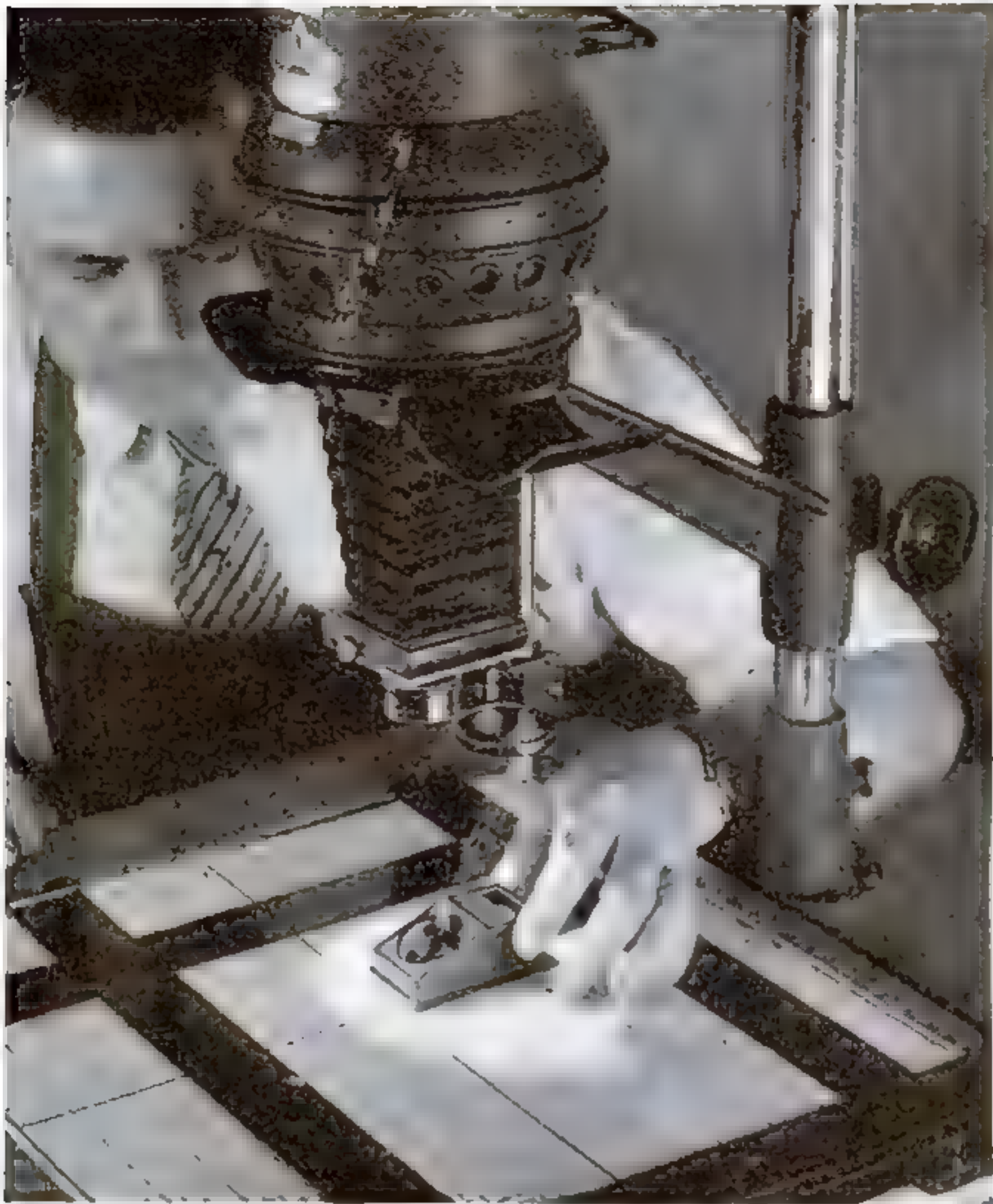
A HANDY kit now on the market for travelers provides not only the conventional compartment for holding comb, brush, toothpaste, and other toilet articles, but also includes a second section, opened by means of snap fasteners, for neckties, collars, socks, and handkerchiefs. The toilet-article compartment has a moisture-proof lining of oiled silk.



Compartment at right for toilet items is lined with oiled silk. Section above holds small articles







# Six New

## Meter Determines Enlarging Exposure

**A**MATEUR photographers doing their own enlarging now can determine what exposure must be used for any given negative by means of a compact meter of the extension type. The instrument is placed on the easel which holds the enlarging paper, and light from the enlarger is projected on it through the negative to be printed. The meter contains a translucent screen of graduated density provided with numbers which correspond to the diaphragm-opening numbers on the enlarger. A small amount of light reaching the meter permits the operator to read the first number. Increasing amounts of light make the numbers on the denser portions of the screen visible. The densest number that can be read indicates the exposure required for best results in enlarging.

## Make-Up Kit for Portrait Sitters

**E**SPECIALLY designed for amateur camera fans, a new make-up kit contains eleven different items for use in preparing subjects for portrait sittings. Besides powders, creams, and rouge, the box holds a variety of accessories by means of which the make-up can be applied to produce the best effect.

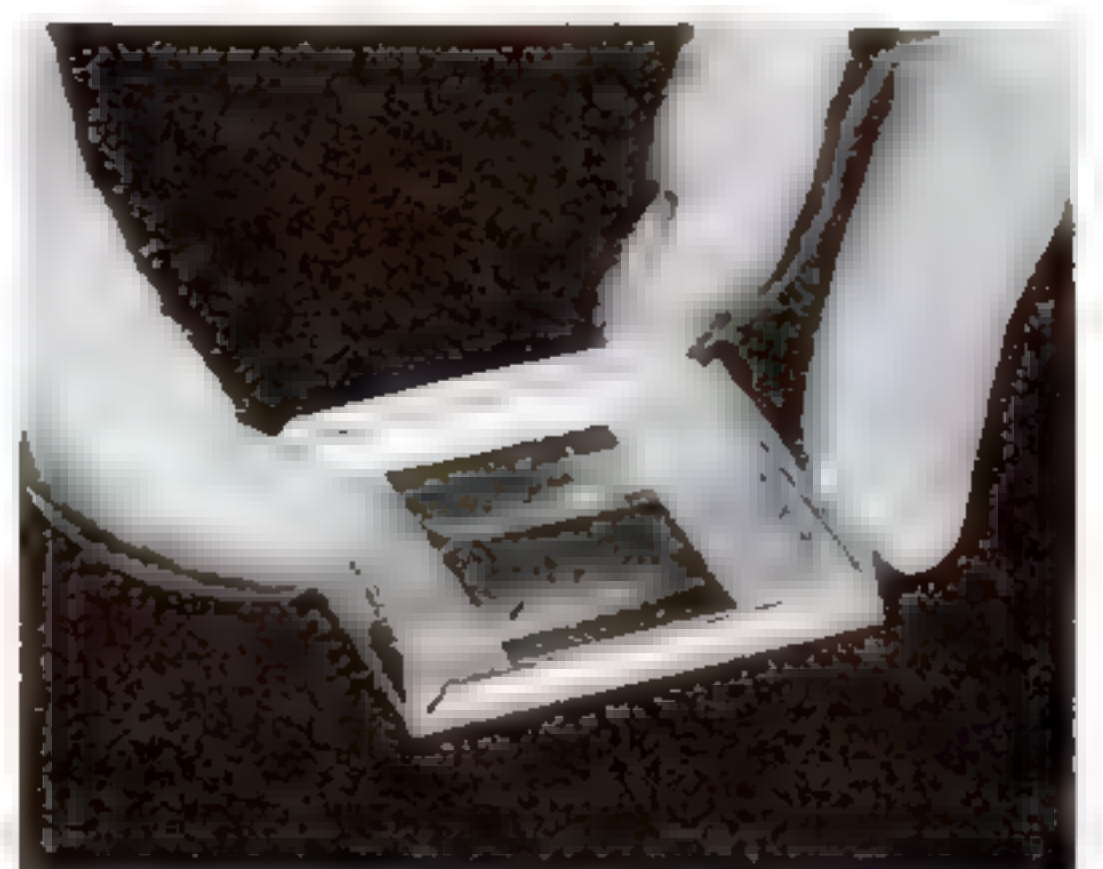
A second kit, holding thirteen items, has been put on the market for the use of camera fans who are trying their hand at making natural-color portraits.



The kit contains all the necessary cosmetics for photographic make-up



## Soft Metal Frames Aid Slide Makers



**E**ASILY BENT metal frames for binding black-and-white and color transparencies into slides for use in projection machines are handy accessories. The films are simply placed between two thin sheets of glass and the soft metal, which can be used over and over, is bent around the edge to hold the glass "sandwich" together.



# Aids For Camera Fans

## Viewer Notches Negatives Chosen for Enlargement

**S**IMPLIFYING the work of picking out the best negatives for enlarging from a strip of thirty-five-millimeter miniature-camera film, a new combination viewer and punch is one of the latest additions to the list of equipment available to the user of a small camera. The device is fitted with a convenient handle for holding the viewer steady while it is in use. The strip of film is passed one frame at a time before a magnifying glass, through which the operator views the negatives. When a frame that is particularly suitable for enlarging is encountered, the operator manipulates a punching mechanism incorporated into the viewer and clips out a small semicircular notch in one side of the film. Later, in the darkroom, the strip of film can be run rapidly through the enlarging machine, stopping only at the notched frames.



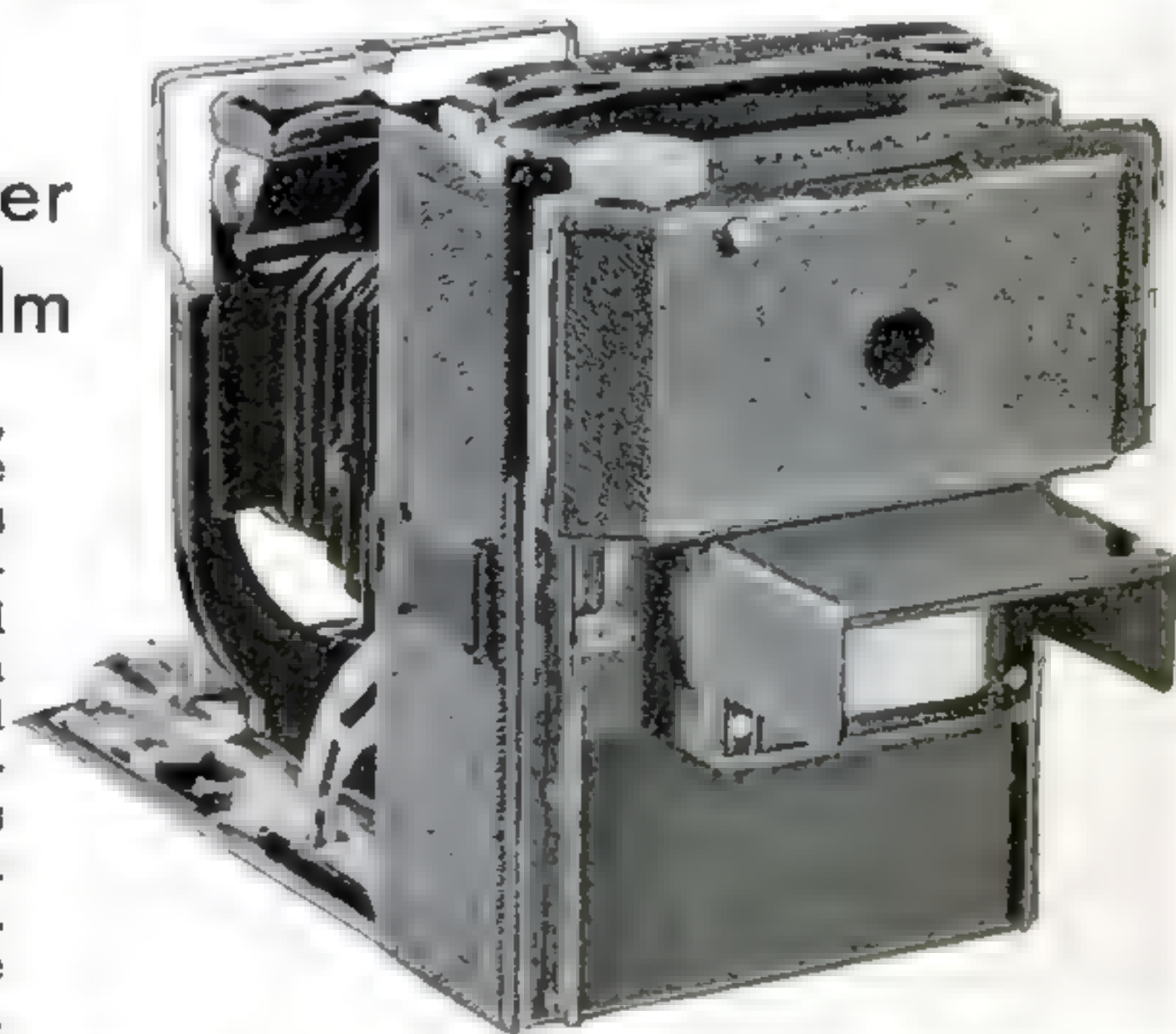
## Daylight Loader Feeds Bulk Film into Cartridge



**A**NOTHER aid for miniature-camera fans is a daylight winder for loading cartridges with thirty-five-millimeter film purchased in bulk. After the bulk film is placed in the mechanism in the darkroom, all other operations can be carried on in full daylight. Another advantage, according to the manufacturer, is that the user can load the cartridges with short lengths of film, to take a few pictures at a time.

## Pack-Type-Camera Adapter Uses Small-Size Color Film

**B**Y MEANS of a newly marketed adapter, cameras which make pictures as large as  $3\frac{1}{4}$ " by  $4\frac{1}{4}$ " can use small-size rolls of color film. Besides the economy feature, the new arrangement permits critical ground-glass focusing; pictures which take advantage of a long-focus lens; and close-up shots of small objects like insects and flowers. The adapter consists of a film chamber accommodating an eight-exposure roll of color film, and a ground-glass focusing panel. The picture is brought into focus on the ground glass. Then the film chamber is slid into place and the picture taken.



Pictures on miniature-camera color film can be taken with a film-pack camera using this handy new adapter

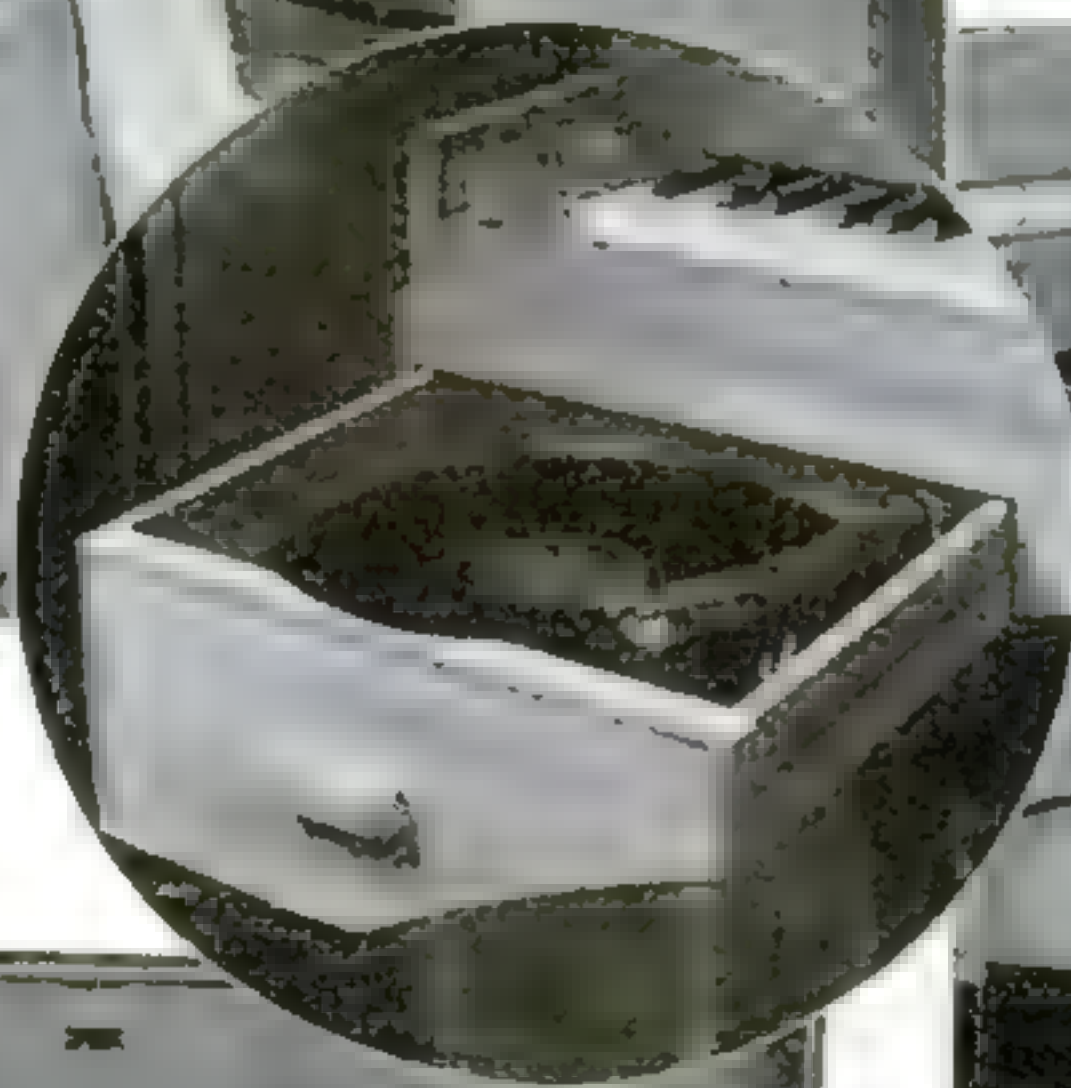


# New Piano Has No Sound Board



Finished attractively, this small piano has the volume and tone of a grand piano

**O**PERATED electrically, a new small upright piano just introduced has no sound board, yet is said to match the tone, range, and volume of a grand piano. Fitted with the conventional eighty-eight-note keyboard, the instrument employs an amplifier and loudspeaker and a novel pick-up system. Set close to each piano string on an adjustable screw is a small metal disk. Each disk acts as one plate of a variable condenser, the corresponding string serving as the other plate. When a note is struck, the string vibrates, varying the voltage across the gap. Played without amplification, the piano has the soft tones of a harpsichord. A built-in radio and an electric phonograph also utilize the amplifying and loudspeaker system.

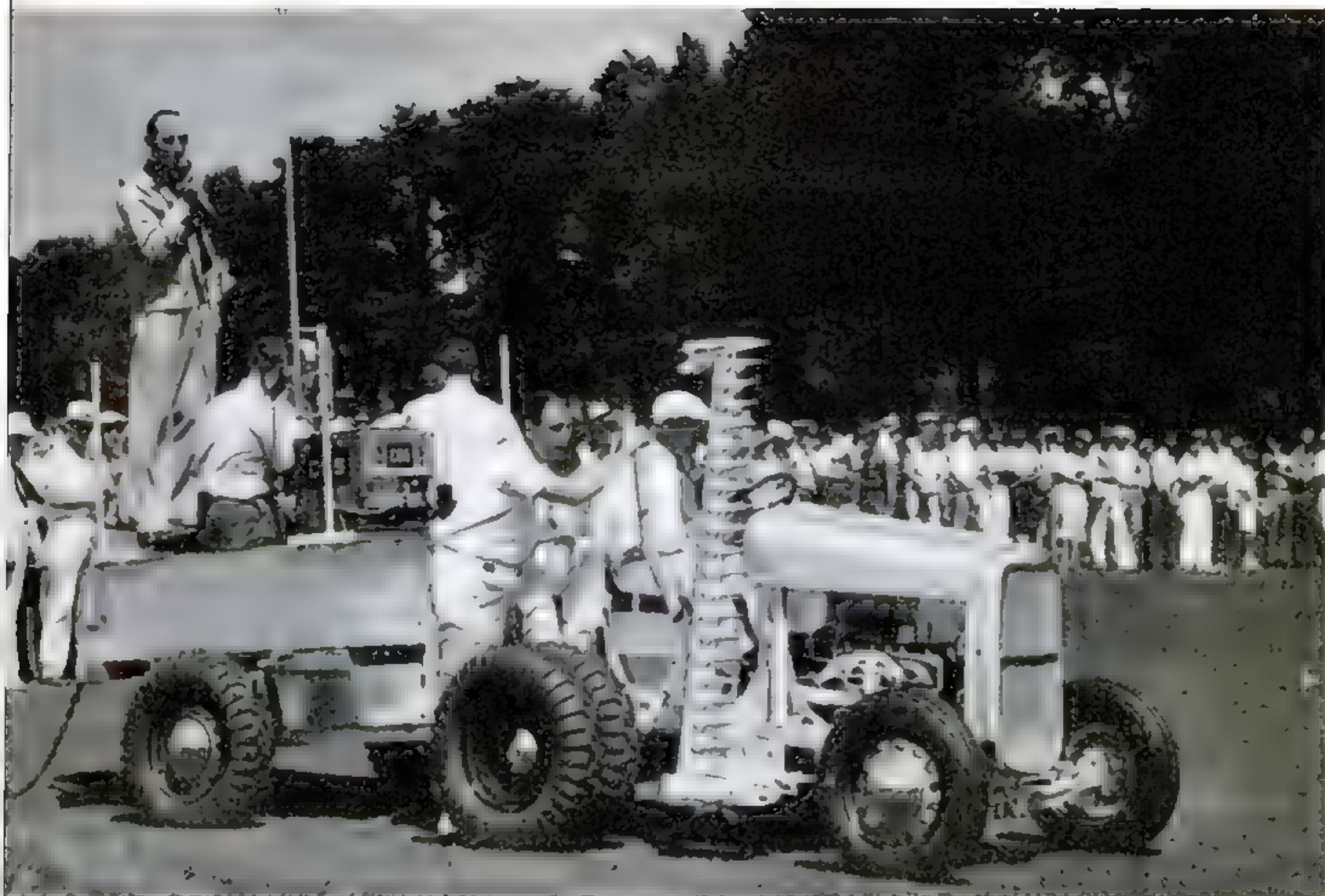


Under one end of the full-length keyboard is a radio; at the other end (inset), is an electric phonograph



The piano is tuned conventionally, while adjustable disks, above, balance each tone's volume. Left, note absence of any sound board





## Mower Is Mobile "Studio" for Golf-Match Broadcast

TO FACILITATE their coverage of a recent golf tournament, the crew of a broadcasting chain pressed into service a power-driven golf-course lawn mower. Following golfers over the course from tee to green, the lawn-mower broadcasting truck carried an announcer and his assistant, a technical operating

crew, and complete short-wave transmitting equipment for relaying the progress of matches for rebroadcast over a coast-to-coast network. The photograph shows Ted Husing, well-known sports announcer, describing a match.

## New Atomizer Is Unbreakable

MADE without glass or moving parts, a new atomizer for spraying the hair with tonics and oils is practically unbreakable, according to its makers. The device, shown in use at the right, has a metal container for the liquid, but is constructed chiefly of rubber, a bulb providing air for the spray. A rubber cap prevents evaporation of the liquid.



All rubber except for its metal container for liquids, this atomizer will not break

## Buttons Eject Keys from Case

WHEN a metal projection on a novel, "one-hand" key case is pressed, keys are ejected through the bottom into a position for use. Pressure on a small knob automatically draws the keys back into the case. The eight-key holder comes in a wide variety of leathers.





## Synthetic-Resin Coat Makes Paper Washable

COATING paper or cardboard with a waterproof synthetic resin, a machine invented by Bert C. Miller of New York City is said to save as much as seventy-five percent of the cost of manufacturing material for cartons, printing, and other uses. Paper passes across two rollers, one of which heats it to 350 degrees F., while the other applies the resin coating. When applied after printing, the coating provides a protective covering.



Bert C. Miller demonstrating his paper-coating machine. Resin comes in chunks like that held in hand at left, and is melted in the tank shown

## The Net Is on the Paddle in This New Ball Game

CATCHING a rubber ball in a net mounted on one side of a paddle is the object of a game introduced recently. The ball is batted back and forth until a player succeeds in trapping it in the net, when two points are scored and the ball is again put into play. A score of twenty-one points wins. The photograph shows a player who has just netted the ball.



When the tube is squeezed, a fire-snuffing chemical squirts on flames

## Squeeze Tube Holds Fire Extinguisher

CARBON tetrachloride, a fire-snuffing chemical, is now packed in an economical metal tube for convenience in fighting small fires. When the cap is removed, the liquid can be squeezed out in the form of a stream that is said to carry for a distance of fifteen feet. If all the chemical is not employed at one time, the cap may be put on and the remainder preserved for possible use in any other emergency.

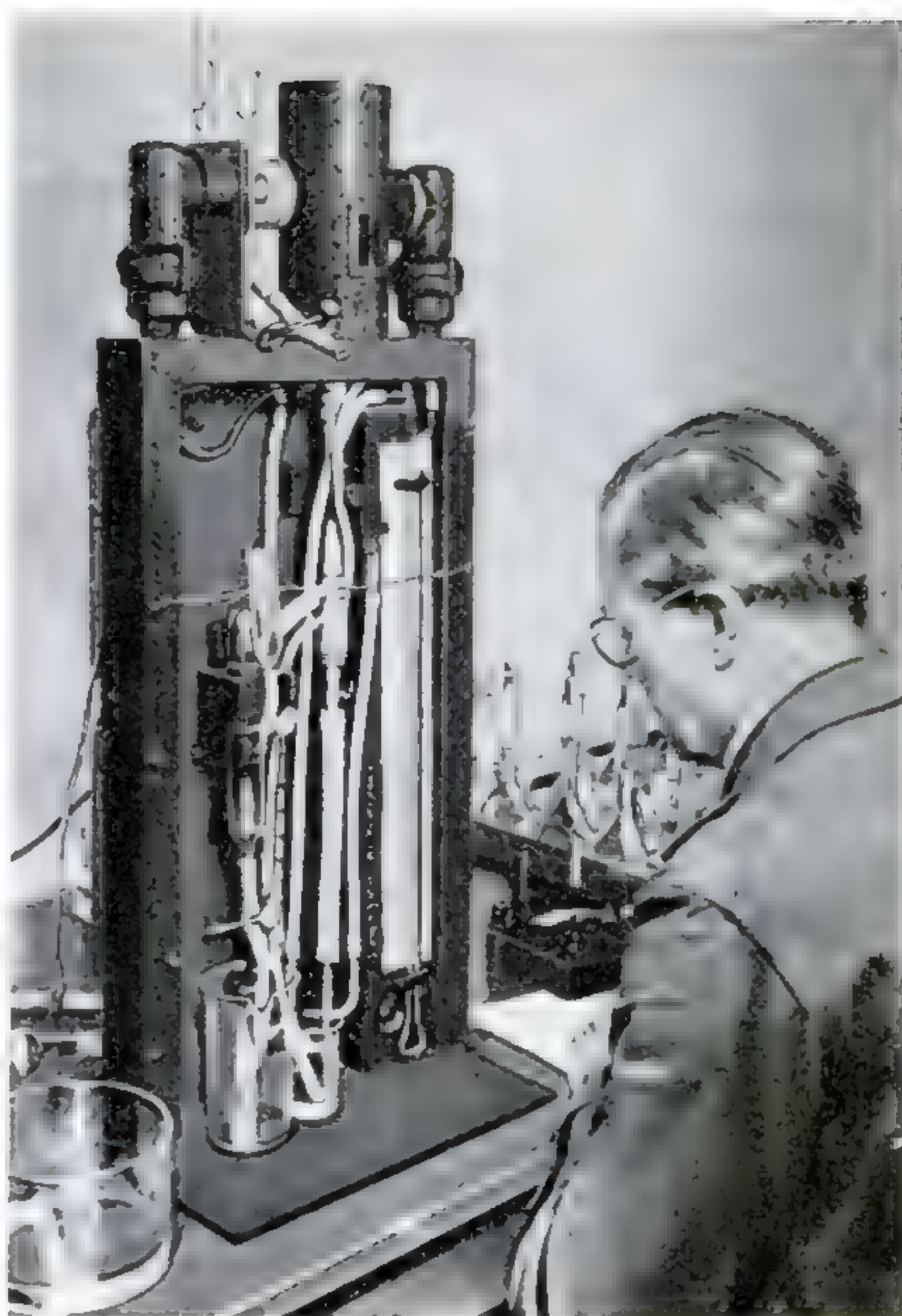


## "Fertility Meter" Analyzes Soil

SOIL analysis is made a matter of seconds by an electric "fertility meter" recently developed in Germany. When a sample of soil is placed in the apparatus pictured at the right, a graduated scale shows at a glance whether the soil is acid or alkaline, and indicates its richness in phosphate and other plant-food ingredients. With this information, experts can prescribe the proper kind and amount of fertilizer to be used in the soil tested, to give the best possible crop yield.

## New Permanent Ink Writes on Glass

DESIGNED for writing on glass, porcelain, china, and similar surfaces, a new ink is said to give a permanent marking that resists the action of water, acids, alkalies, and strong solvents. Unlike other inks used for similar purposes, it is non-corrosive, and can be kept in ordinary glass bottles. Applied with any steel writing pen, drawing pen, or fine brush, the new ink is expected to prove specially useful for marking chemical glassware and microscope slides.



This electric apparatus analyzes a sample of soil instantly

## Rings on Telephone Dial Make It Easier To Use

OPERATION of a dial telephone is said to be made easier by the use of a set of metal rings, just made available, which snap into place in the finger holes on the dial. As a call is made, the rings turn with the finger as it revolves the dial. Because the rings turn with the finger, the makers claim, calls can now be made with greater ease and with less danger of breaking a finger nail during the dialing process. Quicker dialing, and less chance of error, are other advantages claimed for the rings, shown being attached.



## Rack Holds Electric Razor

A HANDY bathroom accessory for shavers, just placed on the market, is the electric-razor holder shown in the photograph above. Mounted against the wall, the holder has spring clips that clamp the razor securely in place, making it unnecessary to stuff the razor and its cord back into a box and put them away after use.





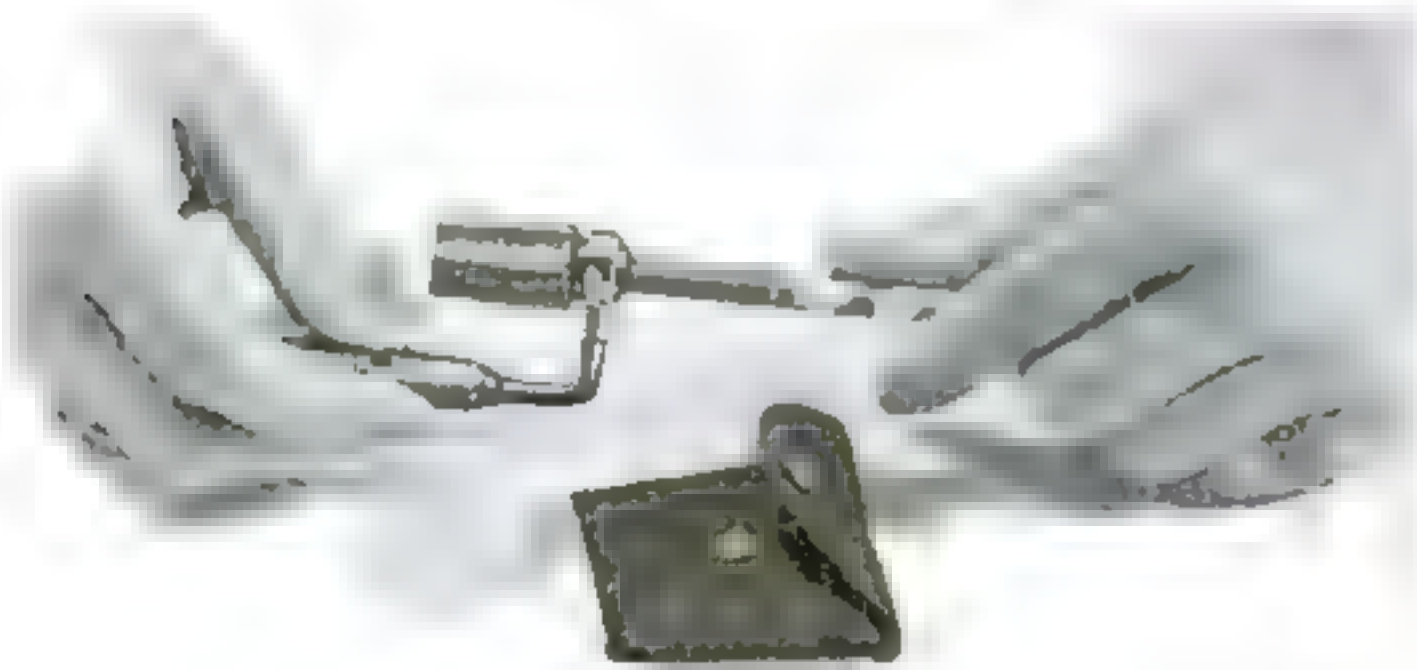
The inventor puts the finishing touches on a scene painted in colors chosen by the chart

Using the color chart to transpose a sheet of music into its corresponding color tones



## Chart Transposes Musical Notes into Colors

WHAT is the color of your favorite piece of music? After several years of research into the relationship of music to color, Dr. Carl Omeron and Archie Vasquez, of Los Angeles, Calif., support the theory that all musical tones have their corresponding colors of the spectrum. To translate a note into its appropriate hue, they use a novel instrument of their own devising called a "color-tono-graph." This is a chart having a movable indicator for rapid transposing of any written note into its individual color. By this means, the experimenters claim, musical selections can be painted as well as played. Soon, they believe, homes may be painted in colors that harmonize with the musical tastes of occupants.

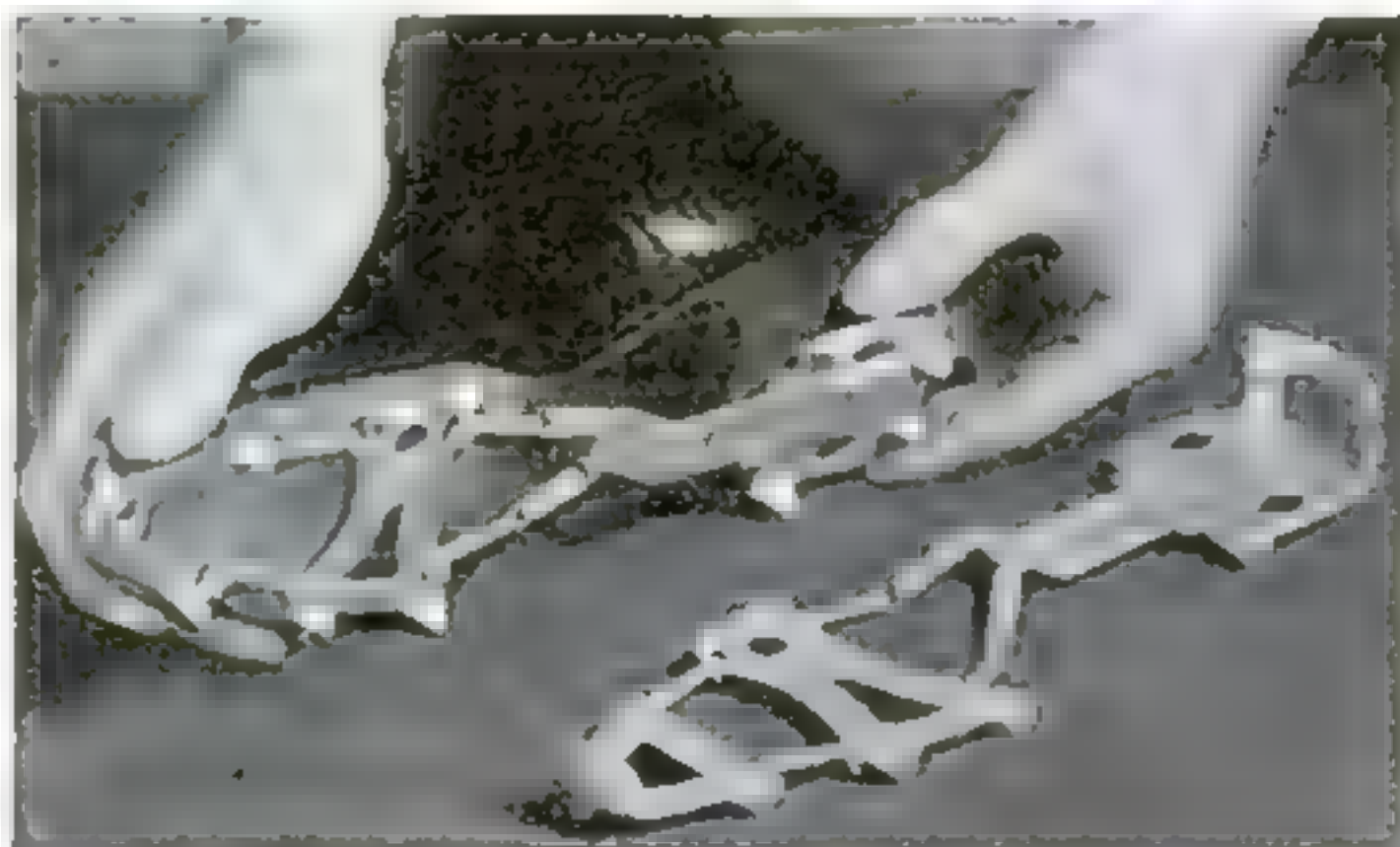


## Pocket Pencil Sharpener

PENCILS can be sharpened without soiling your fingers, with a handy vest-pocket machine just marketed. A pencil is pointed by placing it into the sharpening unit, which is then revolved by means of an extension handle, as illustrated in the photograph at the left. The sharpener handle folds up to render the unit compact when not in actual use.

## Adjustable Ice Creepers Will Fit Shoes of Any Size

ADJUSTABLE creepers invented by Eugene Farmer, of Elmhurst, N. Y., for walking on slippery ice, will fit on over shoes, rubbers, or galoshes of any standard size. Equipped with triangular spikes on the bottom, the metal creepers have a clamp at one end that clips over the shoe tip, and a saddle at the other end that clings snugly to the heel. Springs keep the ice walkers tight to the shoe, while a locking device just forward of the heel plate permits the user to adjust them easily for the length desired.



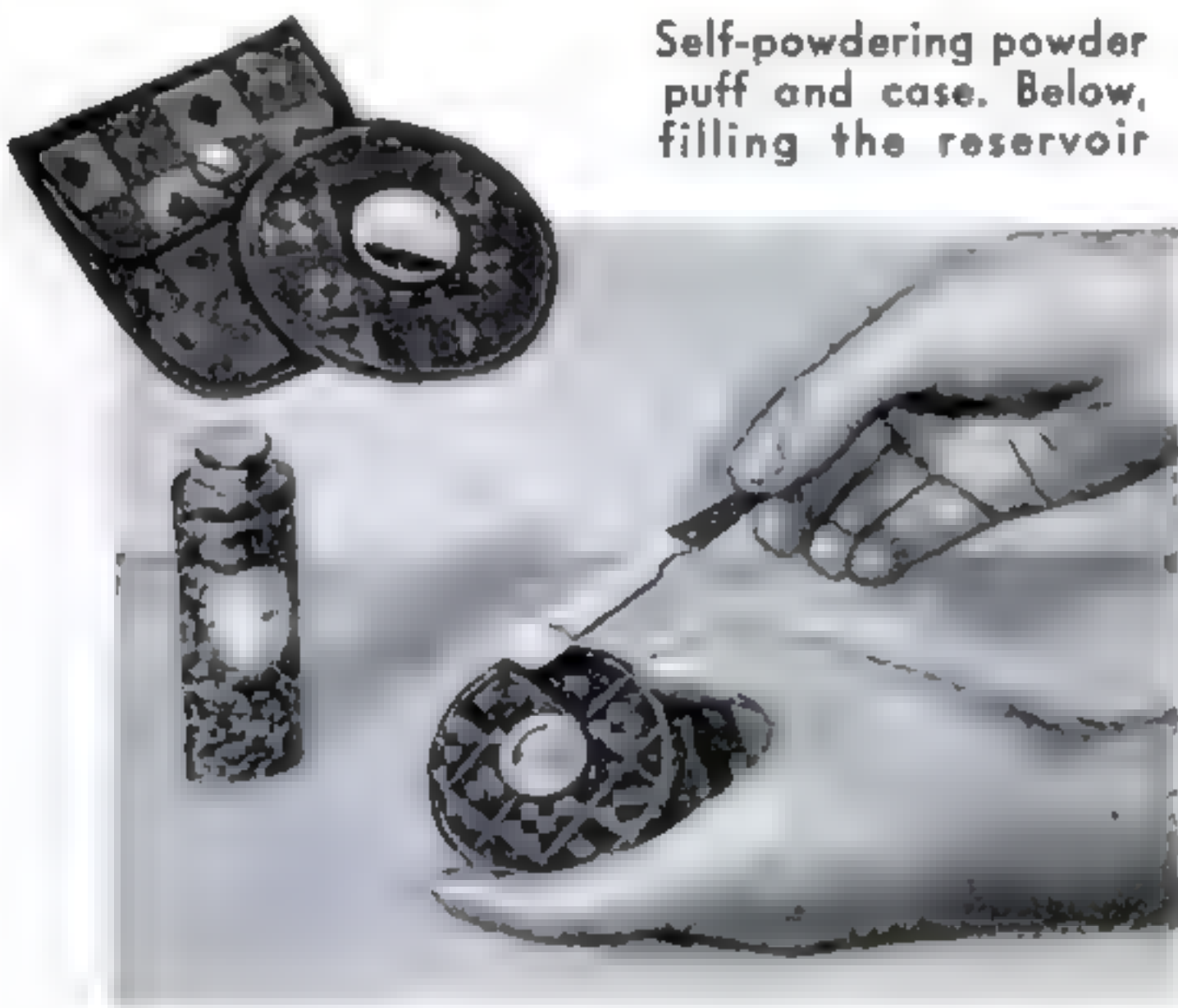




## Indoor Man-of-War Trains Sailors

A WARSHIP that will never be launched into the water has just been completed at the Naval Armory in Detroit, Mich. Measuring 131 feet long, the indoor man-of-war was built for the purpose of training 600 Naval

Reserve officers in the fine points of warship construction and operation. The \$50,000 land vessel has the hull of a cruiser, the bridge of a battleship, and the guns of a destroyer. The dry-land warship is seen in the photo above.



Self-powdering powder puff and case. Below, filling the reservoir

## New Magazine Powder Puff

A POWDER puff now available has its own built-in powder container. In use, the powder sifts through the puff fabric as the puff is dabbed over the skin. The powder reservoir is refilled through a rotating metal top, as illustrated above.

## Snake Venom Soothes Eyes

DEADLY rattlesnake and cobra venom is being used to relieve pain in diseases of the eye. The venom also is employed to stop bleeding during eye operations, and for treatment of trachoma and cancer of the eye.

## Violet Rays Replace Rouge

AN ELECTRICALLY operated rouging machine recently introduced for beauty-shop use has a Y-shaped glass tube that emits violet rays that are said to stimulate blood circulation in the cheeks and produce a natural red color.



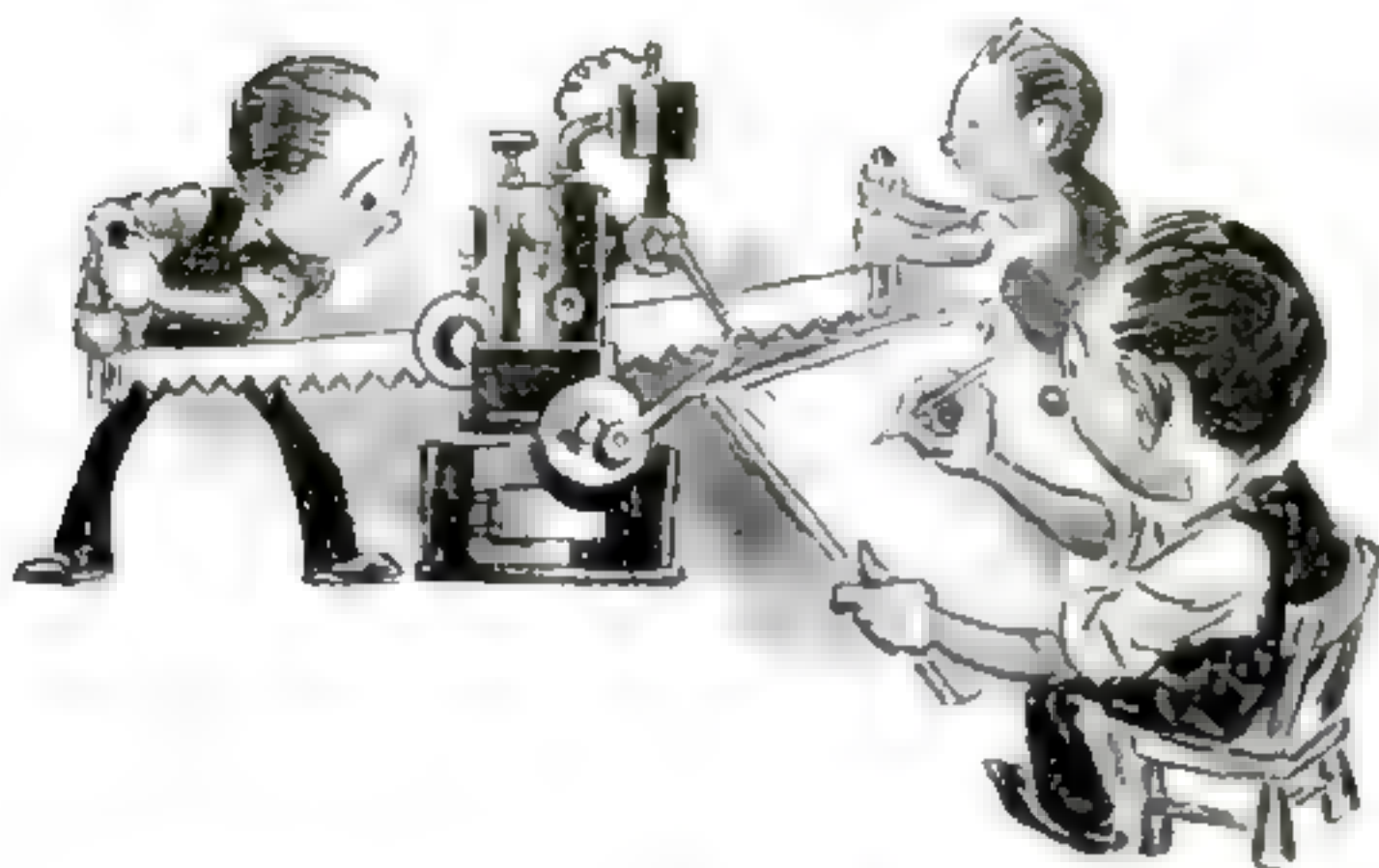
Rays from the Y-shaped tube bring color to cheeks



# POPULAR SCIENCE

## Question Bee

Do you know your way around in the world of science and mechanics? Try to pick out the correct statement in each of the paragraphs below. Note the corresponding letter and check on page 240



1 A drawing showing a machine apparently sliced in two is called a (a) midsection (b) cross section (c) conic section (d) Caesarean section.

2 Camera lenses of high optical quality are known as (a) bifocals (b) anastigmats (c) optical flats (d) heliostats (e) oil-immersion objectives.

3 The hardest known substance is (a) tungsten (b) fused quartz (c) the diamond (d) duralumin.

4 One thousand grams make (a) a kilogram (b) a milligram (c) an anagram (d) a cryptogram.

5 Microscopists use a transparent cement sold under the name of (a) balm of Gilead (b) Canada balsam (c) French brier (d) Peruvian bark.

6 When placed in an acid, a strip of litmus paper is colored (a) brown (b) blue (c) red (d) green (e) yellow.

7 If one cylinder of your car appears to be misfiring, you should (a) ride the clutch (b) check the ignition (c) retard the spark (d) blow a cylinder head.

8 Electrical insulators belong to a class of substances called (a) dielectrics (b) electrolytes (c) eutectics (d) vesicants.

9 A piece of metal built up out of a number of thin sheets is called (a) articulated (b) striated (c) laminated (d) prefabricated (e) matriculated.

10 The distance between a car's front and rear axles is its (a) focal length (b) wheelbase (c) camber (d) turning radius.

11 Sodium vapor is now being utilized successfully in (a) dirigibles (b) electric lamps (c) bottled gas for country homes (d) anesthesia.

12 Machine parts may vary from specified dimensions by an amount called the (a) tolerance (b) easement (c) roughage (d) plethora.

13 A chemist uses the abbreviation "ppt." for (a) a pipette (b) a phosphate (c) a precipitate (d) phenolphthalein.

14 Tetraethyl lead is used in (a) dental fillings (b) antiknock gasoline (c) smokeless powder (d) colored pencils.

15 A common mechanical device to keep a wheel or shaft from turning the wrong way is called a (a) cam (b) bell crank (c) ratchet (d) gasket.

16 Parts of a small organism are often differentiated more clearly under the microscope by (a) gilding it (b) staining it (c) boiling it (d) etching it with strong acid.

17 You could demonstrate the rotation of the earth with a (a) Cartesian diver (b) manometric flame (c) Foucault pendulum (d) Torricellian vacuum.

18 Amber is (a) a natural by-product of the growth of coral (b) a mineral deposited in veins by underground waters (c) a fossil resin from prehistoric trees (d) a substance secreted by sick whales.

19 Entomologists study (a) fish (b) insects (c) trees (d) climate.

20 A development of great social significance to a large part of the country is foreseen in the introduction, by the Rust brothers, of a machine to (a) pick cotton mechanically (b) convert water into a fuel for automobiles (c) detect when people are telling lies (d) calculate the value of pi to forty-seven decimal places.



# Un-Natural History By GUS MAGER



ONE OF THE  
**GIANT WASPS** HAS ASTONISHED  
ENTOMOLOGISTS BY USING A TOOL—  
A PEBBLE HELD IN THE MOUTH  
TO POUND DOWN THE EARTH  
OVER HER BURROW!



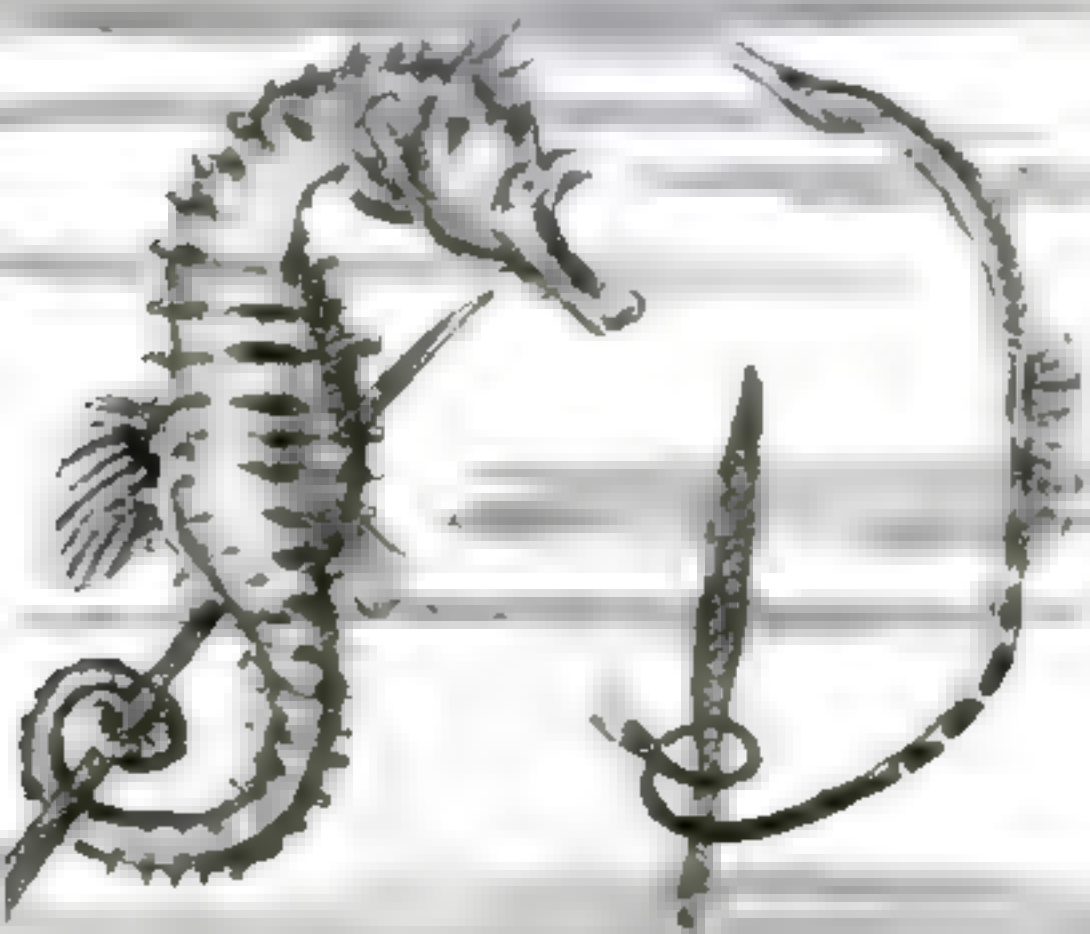
MANY BIRDS DO COURTSHIP DANCES!  
**CRANES**, FOR EXAMPLE, PUT ON AN ACT COMBINING STEPS  
RANGING FROM THE CAKEWALK TO THE SHAG! TALK ABOUT JITTERBUGS!



**REINDEER** ARE ALWAYS COVERED BY A  
BLANKET OF WHITE CLOUD DURING THE  
MIGRATING SEASON! IT IS A MIST  
FORMED BY EVAPORATION OF MOISTURE  
EXUDING FROM THE SKIN!



ALTHOUGH **FLAMINGOS** HAIL FROM SUBTROPICAL  
REGIONS, THEY CAN STAND THE COLD AS WELL AS ANYBODY!  
HOWEVER, IN ZOOS THEY ARE KEPT INDOORS IN WINTER SO  
THEY WON'T FREEZE FAST IN THEIR POOLS!



THE **SEA HORSE** AND A COUSIN,  
THE **PIPE FISH**, ARE THE ONLY FISHES  
SPORTING MONKEYLIKE  
GRASPING TAILS!



HUNTERS AND ZOO KEEPERS SAY  
THAT **LIONS, TIGERS**, AND OTHER LARGE MEMBERS  
OF THE CAT FAMILY ALWAYS ATTACK BLACK MEN  
IN PREFERENCE TO WHITE! EVEN COMPARATIVELY TAME  
BEASTS GET EXCITED WHEN A NEGRO COMES AROUND!



# Latest Convenience

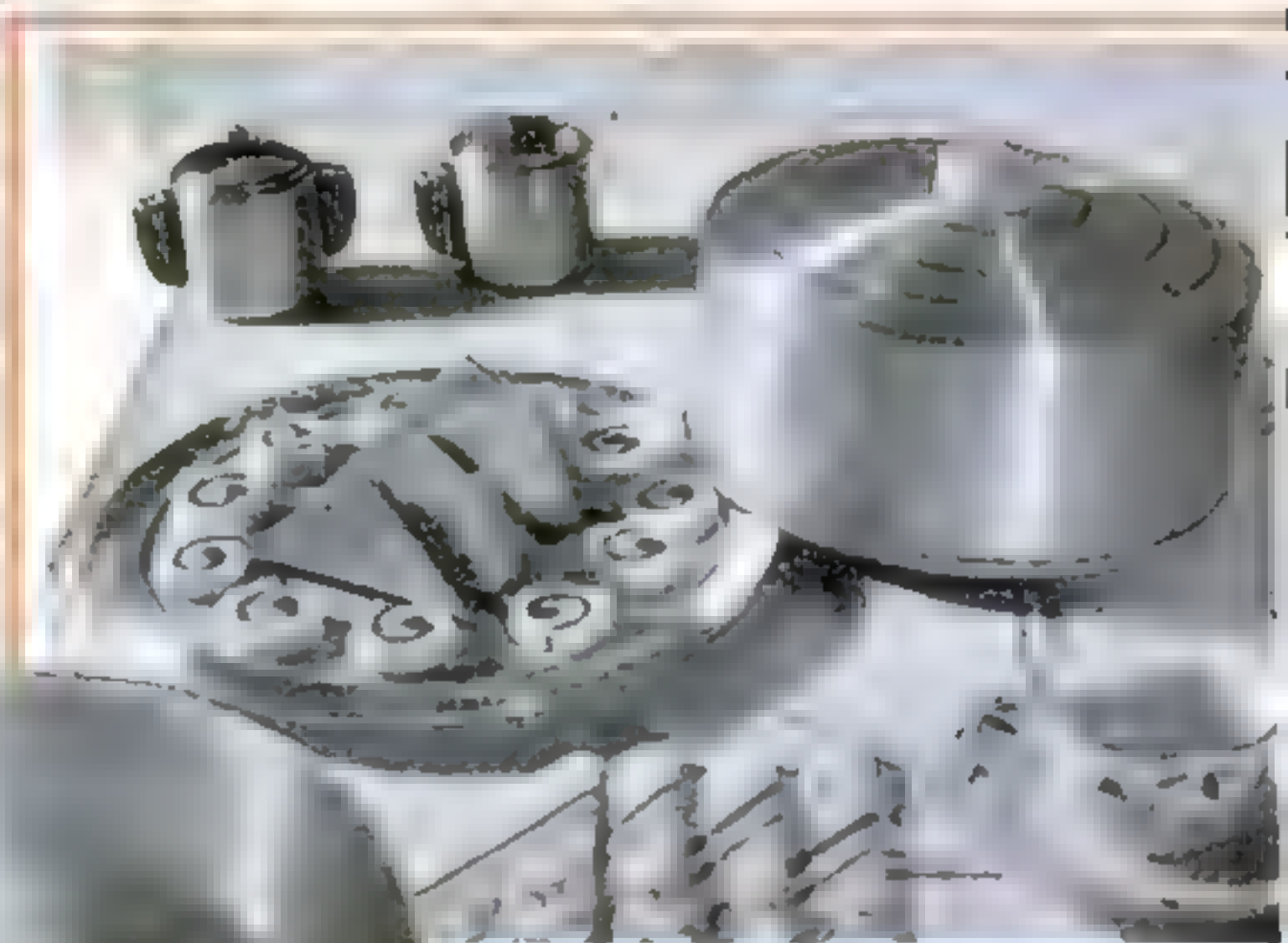


**FIVE-QUART MIXER.** Food can be mixed and prepared in large quantities in the home by the use of a new type of mixer with a capacity of five quarts. The powerful motor is housed in the boxlike supporting stand seen in the photograph



**WALL RACK FOR KITCHEN TOOLS**

Eight cooking necessities, including several knives, are supplied with this handy wall rack. A notch in the handle of each tool enables it to be hung on the crossbar



**SERVER KEEPS FOOD FRESH**

A humidifier built into the cover of this serving tray prevents sandwiches, cakes, and other baked foods from drying out. A spoonful of water moistens the humidifier



**MERRY-GO-ROUND TRAY.** Concocting beverages is a lot of fun with the novel tray at the left. Glasses rest on a roller-bearing chromium turntable which revolves to bring them in turn under a spout through which measured amounts of liquid are pumped from a decanter



# for the Household

**TABLE WARMING OVEN.** More than two feet long, the electric warming oven at the right will hold dozens of rolls, biscuits, or popovers. It also is large enough to take two dozen plates or two large dishes of hot food



**HEATS BABY'S FOOD.** In addition to heating a baby's bottle to the right temperature and then shutting itself off automatically, the electric device below has a porringer for heating solid foods and a vaporizer for use in treating colds. The vaporizer is seen in the inset below

**COFFEEPOT HAS OVERCOAT.** Coffee is kept piping hot for hours in a new coffeepot that fits into a chromium-plated insulating shell. A dripless spout is another special feature



**TOY BOAT TESTS BATH**  
Made in the shape of a boat, the floating bath thermometer illustrated above is sure to appeal to children. For further realism, a stick can be inserted in a hole at the bow, and a paper sail attached







The report made Joe Clark, who was looking over some repair-job slips, jump a foot

# GUS SOLVES Queer Gas-Line Troubles

By MARTIN BUNN

**B**ANG! The sharp report made Joe Clark, who was looking over some repair-job slips at Gus Wilson's workbench, jump a foot.

Gus laughed. "You looked just like a man getting stung by a superpowered wasp," he told his partner in the thriving little Model Garage.

Joe grinned back at him. "Sounded like a blow-out," he said, wiping a clear spot on the misted window pane and peering out into the rain that was coming down in sheets. "That's funny—there's not a car in sight. That driver must have gone right ahead on the flat. Well, that means that some one will be selling him a new tire." Suddenly he looked anxious. "Hey, Gus—that noise sounded as if it was right here in the garage. I wonder—"

"Now, don't go and get yourself all steamed up," Gus said. "That noise *was* right here in the garage, and it *was* a blow-out." He pointed at the right rear wheel of a car that was in for a check-up. Its tire was flatter than a day-before-pay-day bill fold. "There's the baby that made you jump."

"That's a new one on me," Joe said. "First time I ever heard of a tire blowing out while a car was standing in the shop."

"It doesn't happen so very often," Gus admitted. "When it does, it's the result of a bad stone bruise."

"Huh?" Joe asked.

"You're driving along pretty lively—may-

be at fifty-five or sixty an hour," Gus explained. "One of your tires hits a stone. Perhaps you don't even notice it—and if you do notice it, and get out and take a look at your rubber, everything seems all right. The tread of the tire that hit the stone isn't damaged, and you can't see that the inside layer of its fabric is broken. Well, the inner tube works into the break in the fabric, the unbroken layers of fabric can't sustain the air pressure, and your tire blows—maybe hours or maybe even a couple of days after the tire got the stone bruise. See?"

"Sure, I see," Joe said. "Well, Gus, since you're so good at riddles, how about answering this one? While Mrs. Sherman was in buying a new lighter yesterday, she said that her car always runs better—the engine runs smoother—at night than it does in the daytime. She wanted to know how come. I didn't know, but I told her I'd ask you about it."

"That's a cinch," Gus assured him. "There are two reasons. One of them is that the air is cooler and heavier at night. That results in a greater *weight* of air being admitted to the cylinders at each stroke. The greater the weight of air and fuel vapor that is admitted, the more power the engine develops.

"The other reason is that at night the air usually has more moisture in it than it has during the day. The increased moisture slows down combustion. Slower combustion results in lessened detonation—and so, of course, in



increased smoothness of the car's operation."

He waved a monkey wrench menacingly at his partner. "Hey, is this a quiz party?" he demanded. "You ought to have better sense than to get me started talking about gas engines early in the morning. Scram! I've got work to do. Say, where the heck is Harry? That darned grease monkey never is around when—"

"I sent him out with the wrecker," Joe said. "Ez Zacharias—you know him, the R.F.D. carrier—phoned and said he'd have to be towed in. He's got a new car, and he's stalled over on that dirt road back of Mechanicsville."

Half an hour later Harry drove up in the wrecker and towed a shiny new sedan, liberally splashed with mud, into the shop. Ez Zacharias, a big-chested citizen with a weather-darkened face and a postman's cap on the back of his head, climbed out of the towed car.

"By gum!" he said, "I'm mad right down to the soles of my shoes! That old car of mine that I turned in to get this pesky contraption had eighty-nine thousand on her, and she creaked in every joint, but I wish I had her back!"

Gus grinned at him. "Maybe you drove that old wreck so long you forgot how to drive a real automobile," he suggested teasingly. "But what's the trouble, Ez?"

Zacharias pursed his lips and let fly a successful testing shot at the waste box under the workbench. Then he bit a fresh half-inch chew off the end of a stick of black plug. "Trouble enough," he said. "There's something all wrong with the gas line on this here job, and I can't for the life of me find out what it is. It's been givin' me the devil, and my mail's late, and every one on my route is threatenin' to write to Jim Farley and get me fired. Maybe they think *he* could get this car runnin'!"

"I bought her a month ago. For a couple of weeks she ran like a—like a dream. Then that wet spell come along. The first day of it, I went over the route easy as slidin' off a log, and I said to myself: 'Ez, you were pretty smart gettin' this new car before the real bad weather set in.' And then, by gosh, the very next mornin' she wouldn't start!"

"Well, sir, I fooled around and fooled around, tryin' first one thing and then another, and after a while I got around to the carburetor and found that the sediment bowl was jest one solid chunk of ice. And the gas pipe wasn't any better! So I thawed 'em out, and drained the gas tank, and filled it up again. I'd bought some gas off a feller out

A big-chested man with a postman's cap on the back of his head climbed out of the towed car. "By gum," he said. "I'm mad down to the soles of my shoes."





## \$100 in Prizes FOR GARAGE MECHANICS

If you make your living repairing and servicing automobiles, Gus Wilson, Joe Clark, and Martin Bunn would like to hear about the queerest job that you ever tackled and licked. For the most interesting letter of not more than 500 words telling about a mysterious car ailment and the way it was cured, we will pay \$50. The second-best letter will win \$25, and the writers of the five next-best letters will get \$5 each.

Any garage owner or mechanic can enter the contest. Employees of POPULAR SCIENCE MONTHLY and their families are excluded. The judges will be Gus Wilson and the technical editors of this magazine, and their decision will be final. In case of a tie, each tying contestant will be awarded the prize tied for.

Address your letters to Gus Wilson, in care of POPULAR SCIENCE MONTHLY, 353 Fourth Avenue, New York, N. Y., and be sure to mail them before midnight on January 15, 1939, the date when the contest closes. No entries will be returned, and all entries become the property of POPULAR SCIENCE MONTHLY.

in the country the day before, and I figured he'd been careless and given me plenty of water along with it.

"She ran all right for a week after that. Then we had another rainy day, and a right cold night after it. Next mornin'—same darned thing! Sediment bowl and gas line froze solid. After I got her goin', I took her over to the feller I'd bought her from. He went all over everything, and looked wise, and told me that I wouldn't have any more trouble.

"And I didn't—not until this mornin'. She started all right, and ran all right until I got over in those hills back of Mechanicsville. Then the motor began to slow down and miss, and I had to give her the choke to keep it runnin'. When I got to Griggs's store I got out and took a look, and found the sediment bowl full of muddy water. I cleaned it out, and got goin' again. Quarter of a mile farther along—same thing all over again. It was pourin' cats and dogs, but I says: 'Ez, if there's any one who can find out what's wrong with this danged car, it's Gus Wilson.' So I walked to the nearest house with a 'phone, and rung you up. Now you fix her!"

And Zacharias rang the bell with another long-range shot at the waste box.

Gus grinned. "Thanks for the bouquet, Ez," he said. "Now let's see if I can earn it." He tipped his cap over his left eye as he scratched his head thoughtfully.

"Better take a look at her innards," Ez suggested.

Gus shook his head. "No use in that," he said. "You found water—or ice—in the sediment bowl three different times. That proves that somehow water must have got into your gasoline. Well, that happens often enough, one way or another. But you said that it was *muddy* water. Sure of that, Ez?"

"Sure as death and taxes," Zacharias insisted. "That water was as muddy as the bottom of Mud Lake. And when it was froze, you could see the mud in the ice."

"Well," Gus said, thinking out loud, "there's just one way in which *muddy* water could get into the gas line—through the filler pipe." He stooped down, and peered under the rear fender. Then he laughed. "Here it is, Ez," he said, "and it's a brand-new one on me!"

Zacharias stooped down and peered under the fender. "See that hose that connects the filler pipe and the gas tank?" Gus asked. "See that clamp that holds it snug on the gas tank?"

"Sure, I see it," said Zacharias.

"But you don't see a clamp like it holding it snug to the filler pipe, do you? There isn't any. But there should be one. It never was put on, or it's jarred loose and fallen off. Either way, the vibration of the filler pipe has spread the upper end of the hose until it looks like a funnel. Driving on those dirt roads in wet weather, your rear wheels threw a lot of mud and water up inside the fender. Some of it ran down the filler pipe, and dripped into that funnel, and then ran into your gas tank. It'll take me five minutes to put on a clamp, and maybe another ten to drain your tank and carburetor. And then you can get back on your job, and keep out of Jim Farley's black books."

Zacharias straightened up with a grunt, and scored another plopping bullseye on the waste box. "I'll be derved!" was all he said.

An hour or so later, Joe came into the shop. "Saw old Ez driving away with a grin that stretched from one ear to the other," he said. "Nothing much wrong with his car, I suppose?"

Gus told him about it.

"We get quite a few of those gas-line jobs, don't we?" Joe remarked. "None of them amount to much, though."

"They don't amount to much from *our* angle," Gus said, "but they often make a lot of grief for drivers. Most fellows, when their engines don't run (*Continued on page 238*)



# THE HOME WORKSHOP

A man with short dark hair, wearing a yellow sweater over a white shirt and a green tie, is working at a wooden workbench in a workshop. He is holding a blue cloth or piece of material. The workshop has various tools and equipment visible in the background.

*In This Issue*

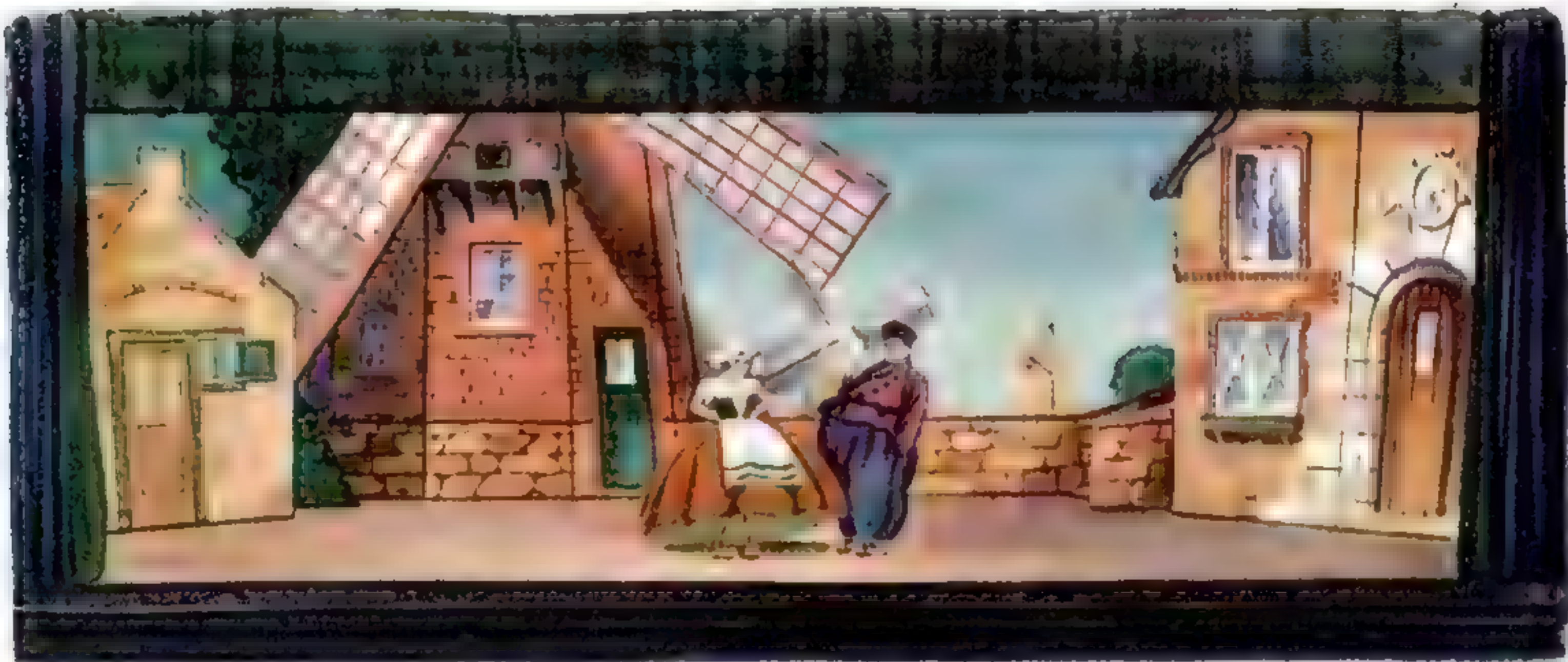
Superdreadnoughts  
in Miniature

Lazy Man's Radio Tuner

Amateur Stage Scenery

Speedy Motor Sled





Setting for "The Red Mill" constructed by the Montclair (N.J.) Operetta Club

# BETTER WAYS TO BUILD Stage Scenery



Many men find it more fun to work on the scenery than to act in an amateur show



By  
**THOMAS L. HALL**

**W**HEN amateur theatricals get under way, the average craftsman often feels more at home constructing a set than acting in front of one. So much more fun is to be found behind the scenes that the building of scenery can become his major interest. Specific rules for erecting stage sets cannot, of course, be given, but the methods outlined here have been used successfully by the Montclair (N.J.) Operetta Club—a group supported by a highly

critical patronage accustomed to the perfection of Broadway productions.

As soon as the play has been chosen, the scenery designer prepares his preliminary plans and checks them carefully with the coach, stage manager, and scenery builder. Every effort is made to have the designs in their final form by the time the play goes into rehearsal, and no major changes are tolerated once the construction work is started.





Miniature stage with design for a set worked out in cardboard

A model stage scaled 1" equals 1' is useful in planning the set. When the design is in shape, dimensioned sketches are made of each part, the floor plan drawn, and the model set up. The scenery is cut from cardboard and colored with crayon.

Most scenery consists of flats with various modifications. For amateur work the flats should be inexpensive but durable enough to be used many times. Determine one or two sizes and adhere to them as closely as possible. Widths 5' and 6' are good; the height is determined by the size and trim of the stage and the shape of the auditorium. Use grade D select Idaho pine  $\frac{7}{8}$ " by  $3\frac{5}{8}$ " (1 by 4's) dressed four sides. The average run of a pile usually

Covering a new profile which has been added to an old flat



How flats are made, covered and painted . . . Doorways and arches . . . Trees and rocks

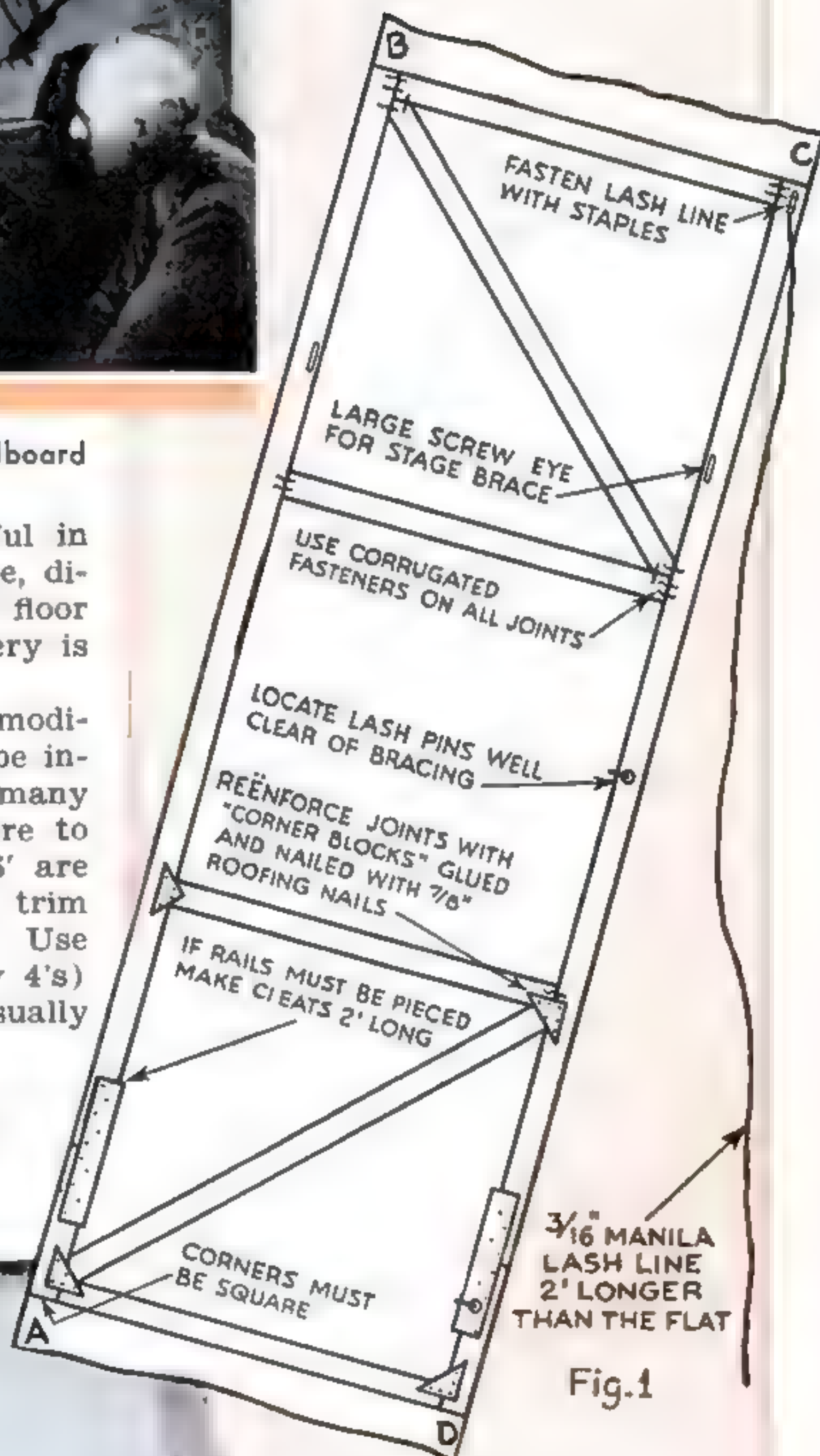
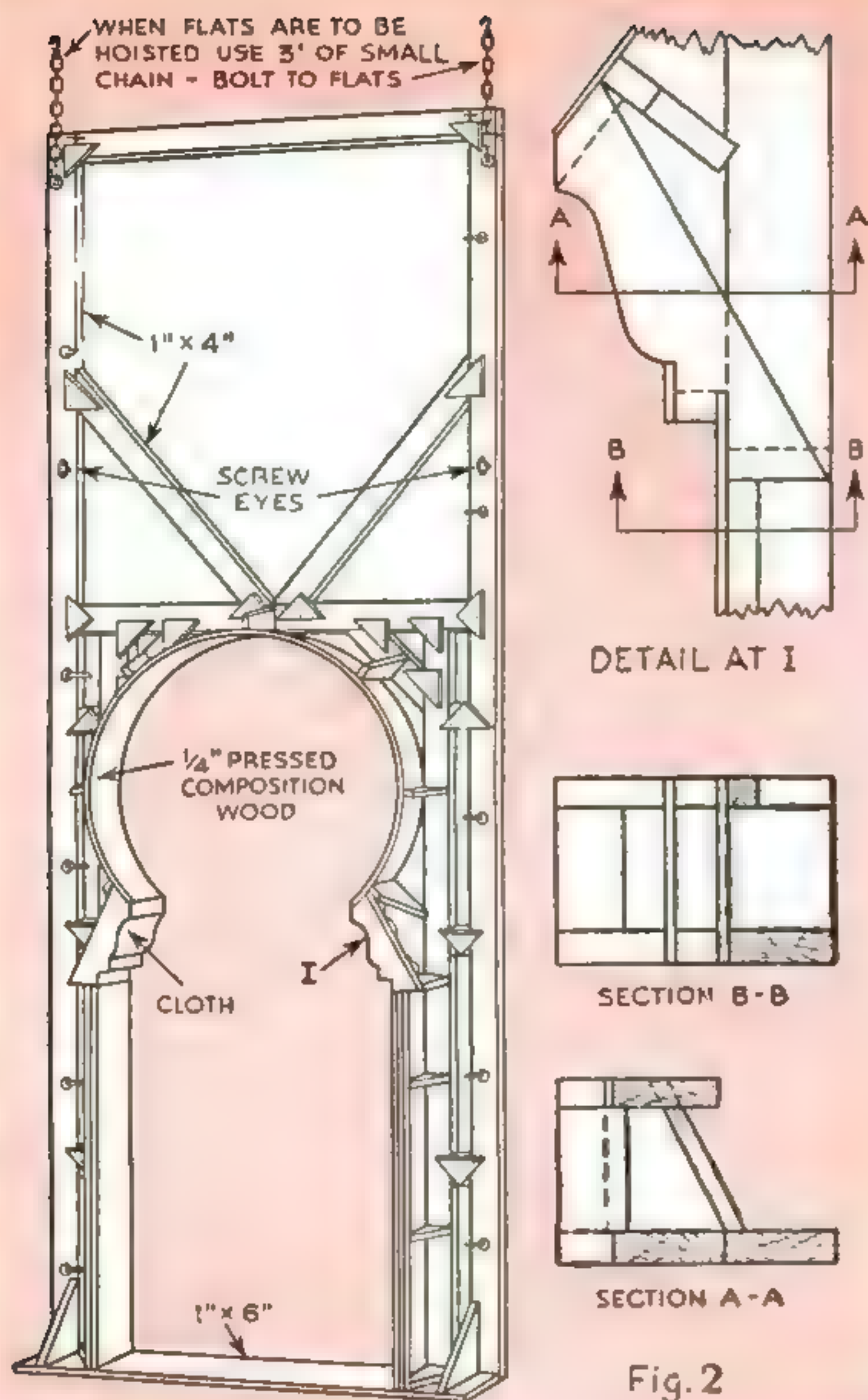


Fig.1

Scenery consists mainly of frames or flats made and covered as in the diagram above. In use, they are lashed edge to edge





DETAIL AT I

SECTION B-B

SECTION A-A

Fig. 2

Rear view and details of a flat containing a Moorish arch. Note how simply the effect of thickness has been obtained

furnishes enough straight pieces for the side rails. Warped pieces can be used for ends and cross braces. The method of constructing the flat frames and covering with cloth is shown in Fig. 1.

Have your lumber dealer cut up a 4' by 8' sheet of  $\frac{1}{4}$ " three-ply fir veneer into right triangles 6" on a side. The result is 256 good corner blocks for about \$4 as compared with \$10 for the professional variety. Buy professional lash pins: making substitutes is not worth while. Big screw eyes are good enough to hold the stage braces. Turn the eyes vertical, and don't let the points stick through the flats. Any kind of molding to hide the joints between flats is useless—the audience never sees the cracks. A badly warped rail can be pulled into place with a wooden hand screw or glue clamp when on stage.

Ordinary unbleached muslin sheeting is fine for covering the flats. Spread the cloth on the floor and place frame on top. Fold the selvage edge of the material over the edge of the frame along AB (Fig. 1) so the threads run square with the flat. Tack the cloth to the back of the frame at A, then pull tight and tack at B. Complete tacking along AB. Now pull straight across and tack at C. Continue along CD, pulling down as well as across. Cut off the surplus and tack the ends, pulling out wrinkles and turning in corners.

Used flats may be cleaned with a mild solution of trisodium-phosphate and a lot of elbow grease. Rubber gloves are advisable for this process. Pour a pint of solution on the flat and rub well with a sponge. Always dry flats in a vertical plane. Patch any holes in the covering by gluing a small piece of muslin on the outside; then brush thin glue over the patch.

After the flats are finished, size them to stretch the cloth and to form a base for the paint. Make the size by mixing 3 lb. of whiting with a bucket of hot water which contains enough dissolved glue to be tacky between the fingers. The size may be neutral or tinted to form the base color of the paint. Slop it on with a 6" brush, but don't let it dry in puddles. The size is also the base of scenery paint. Dry ground colors are simply mixed into it. Making the colors is something that cannot be taught or described—you'll have to



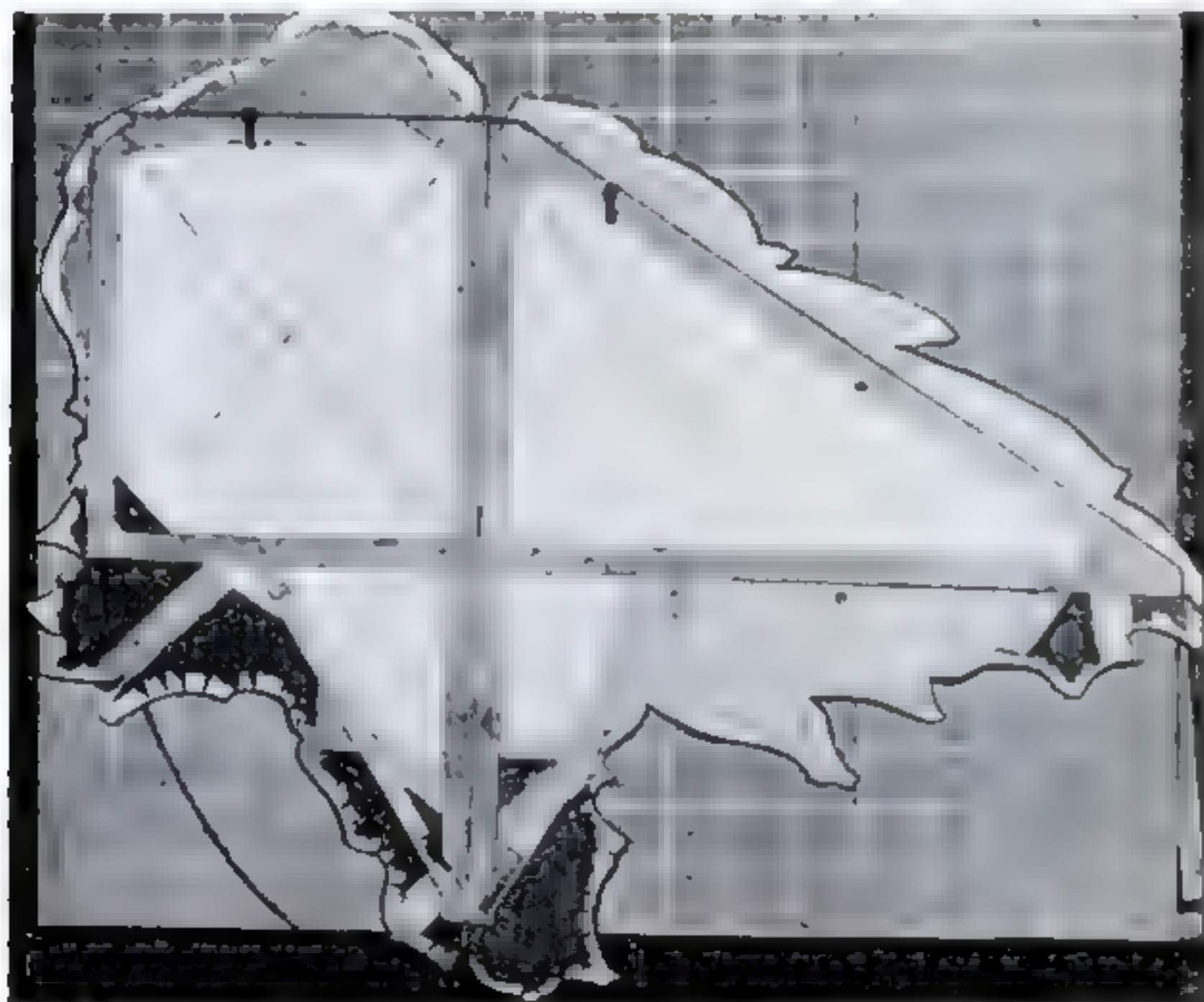
How a muslin covering is applied to an arch made from pressed composition wood so it may be painted more easily





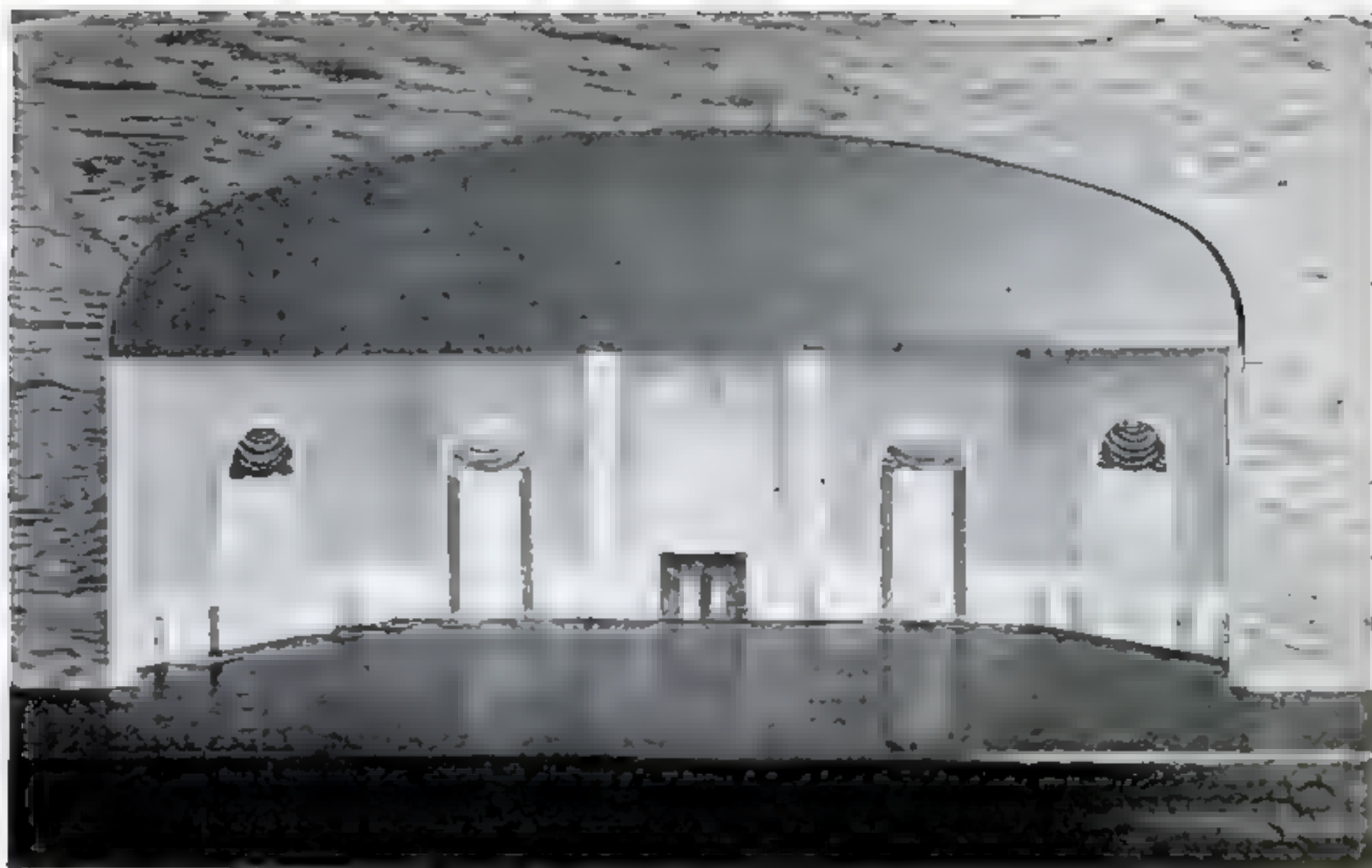
Scale model of a set for the "New Moon." The parts are cut from cardboard and colored with crayons

Left, a tree of this type may be used many times. Below, rear view of tree top to be hung in front of a tree trunk



experiment. For small work or where an intense black is required, show-card colors may be used. These, however, will not stretch cloth if applied alone. Aniline dyes are used for back drops and other "soft" scenery because they have no tendency to stiffen the cloth. *Never* use oil paint.

It is not uncommon to use 20 lb. of glue in building a three-act set. Always buy the flake



variety as it seems to dissolve more easily than ground glue. Prepare it in an ordinary double boiler. Fill the top section with glue, cover with cold water, and let stand overnight before using. Apply both glue and paint while hot. If you use a gas or kerosene stove, a great deal of grief can be saved by standing the double boiler on an ordinary pie tin when heating. In case the water boils over, it will not put out the flame.

Never attempt to make practical door or window frames integral with a flat because the result is always heavy and cumbersome. Frame the opening with 1 by 4's, allowing plenty of clearance all around, and insert the frames. Large openings such as arches require a reveal; that is, a piece around the opening perpendicular to the plane of the flat to give an illusion of thickness. Thin pressed composition wood is strong enough for this purpose and can be bent to almost any curve. For short bends, wet the rough side thoroughly, placing it on the outside of the curve.

A Moorish arch, which has a complicated reveal, is shown in Fig. 2. Note the use of triangular blocks to support the reveal. They should be screwed fast to the framing. Spring the curved reveal into place and nail it to both the frame and the supports.

The intricate curve at *I* is supported by blocks, and the cloth is stretched tight over the curve with the warp running straight up and down. The result is a surface corresponding to the sawed curves. The tread at the bottom should be as wide as the reveal. Don't attempt to make a heavy arch without a bottom piece. This entire arch structure can easily be knocked out of the flat without damage and used elsewhere if



desired. The pressed composition wood used for reveals will not take paint and must be covered with cloth, as shown in one of the photographs. Give the board a coating of thin glue and smooth the cloth over it, brushing out the wrinkles with more glue on a brush. Glue a strip over the turned-up flaps on the curves to cover the bare spots; then paint as usual.

Sometimes it is necessary to construct an arch flat with no bottom. In this case, after the flat is built and covered, another 1 by 4 should be nailed along the back of each rail so as to project about 1" on the outside. This forms a rabbet into which the adjoining flats will fit and thus provides considerable stiffening. Always nail a temporary piece across the bottom of an open arch when not in use.

Profiles or outlines representing rocks,

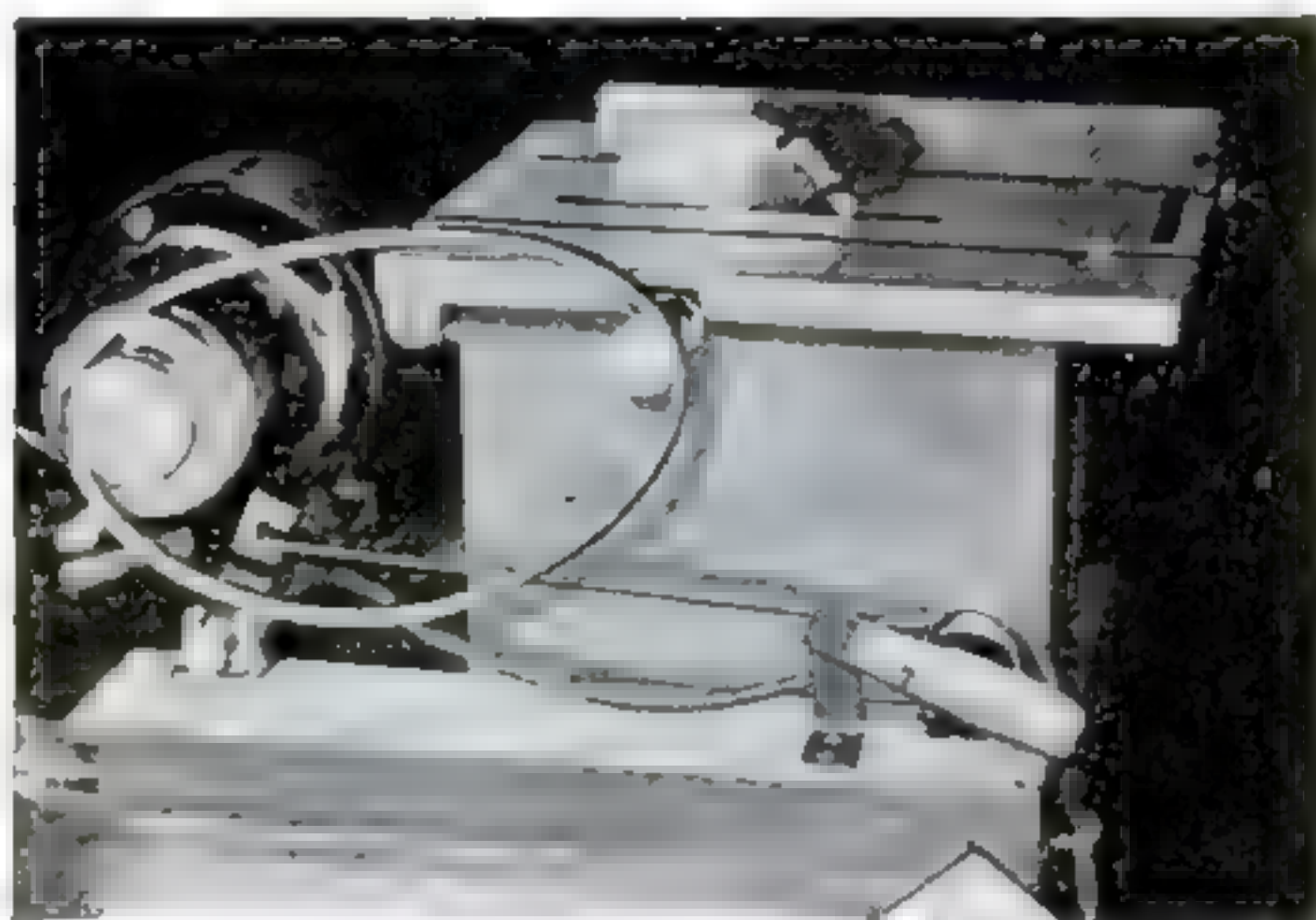
trees, and the like are best cut from pressed composition board and glued and nailed to the flats before covering. Fasten the cloth to the straight part of the flat first and then glue fast to the profile, turning little flaps over the edge and gluing them to the back, as shown in one of the photographs. Rock and tree profiles can be standardized and reused many times with different painting. Three-dimensional rocks are seldom necessary except as property pieces to sit on. They can be concocted from scraps of lumber and some chicken wire. Cover with cloth stuffed out with newspapers. The sloppier this kind of a job is, the better it looks.

*Next month Mr. Hall will give simple ways to make windows, platforms, odd-shaped pieces, and other stage accessories.*

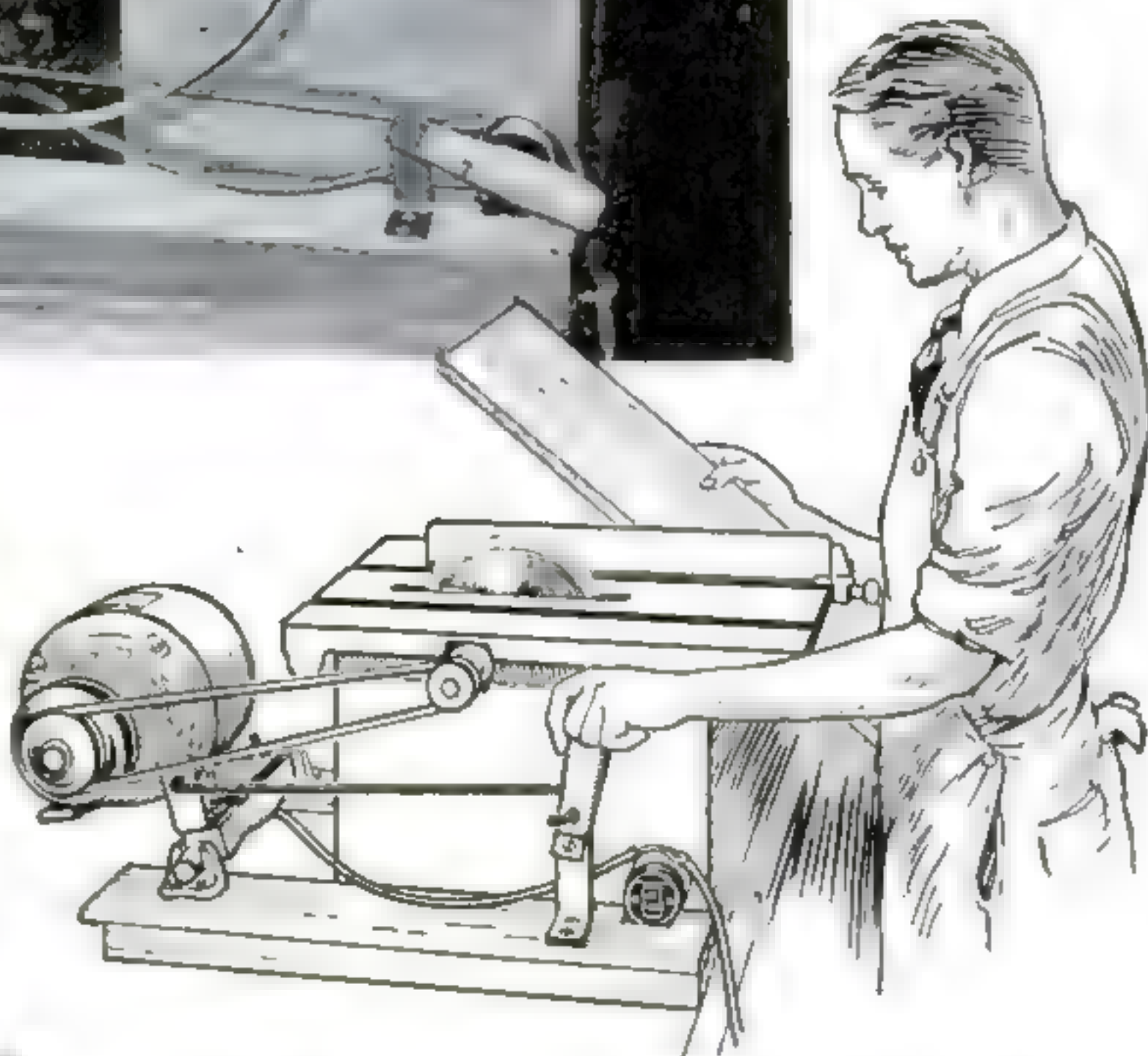
## Motor Started Without Load to Avoid Blowing Fuses

**W**HEN started under load, home workshop motors that are plugged into lighting circuits sometimes blow fuses because of the heavy current drawn in starting. This can be avoided by allowing the motor to run idle when it first starts. One way to do this is to mount the motor on a "floating" rail so it can be tilted forward by pulling a handle as shown. Raising the handle allows the motor to drop back against the belt.

A bracket is bolted to the rail of the motor mounting and connected to the handle by a rod. The handle pivot is placed about 3" above the bench so that when the handle is down, the weight of the motor will keep it in this position. As an additional convenience, the motor is connected through a toggle switch mounted beside the handle, where it can be flipped on with one finger when the handle is lifted.—MERLE TERRILL.



To start, the handle is pulled forward. It is then raised as shown below



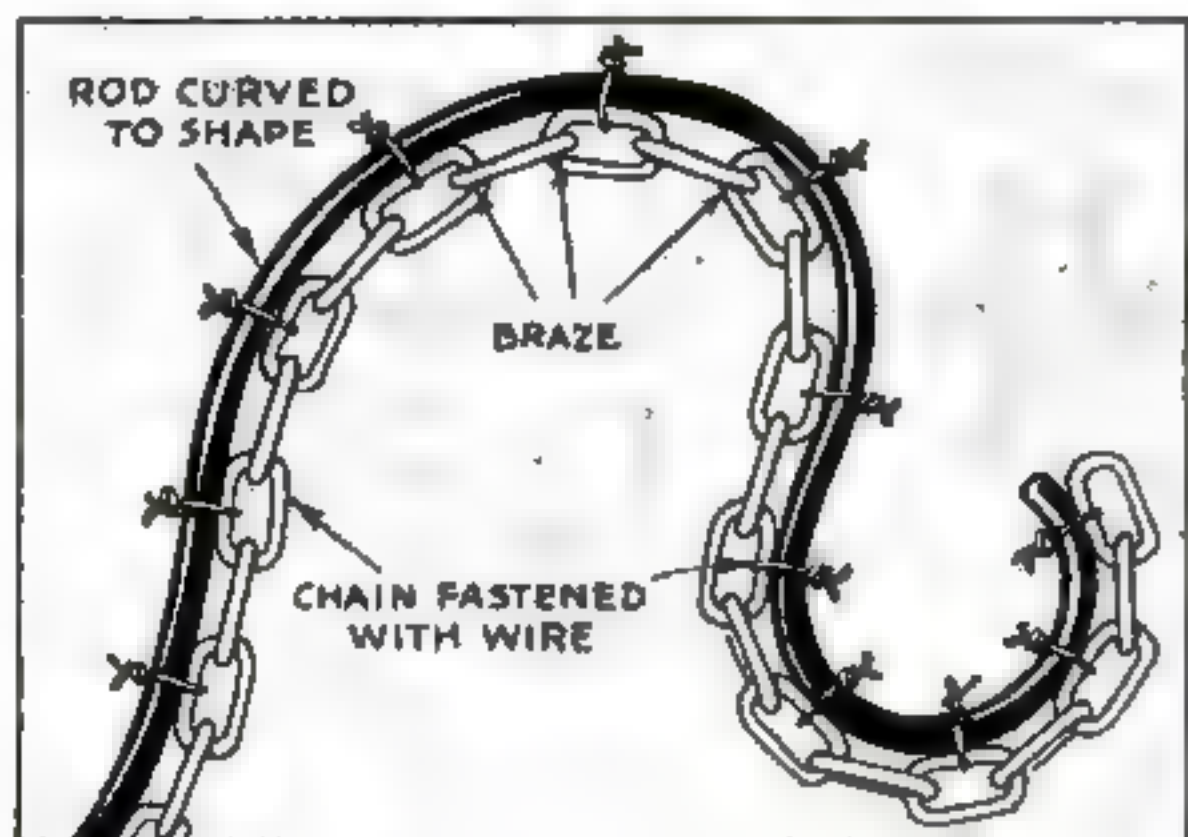
## Nails Pulled from Back of Finished Moldings

IF QUARTER-ROUND base molding, window stops, or other finished woodwork has to be removed and replaced, amateur woodworkers often attempt to drive the nails out, with the result that the puttied nailheads split out large chips. A carpenter avoids this difficulty by pulling the nails through from the back with pincers.—DONALD R. FOSLER.

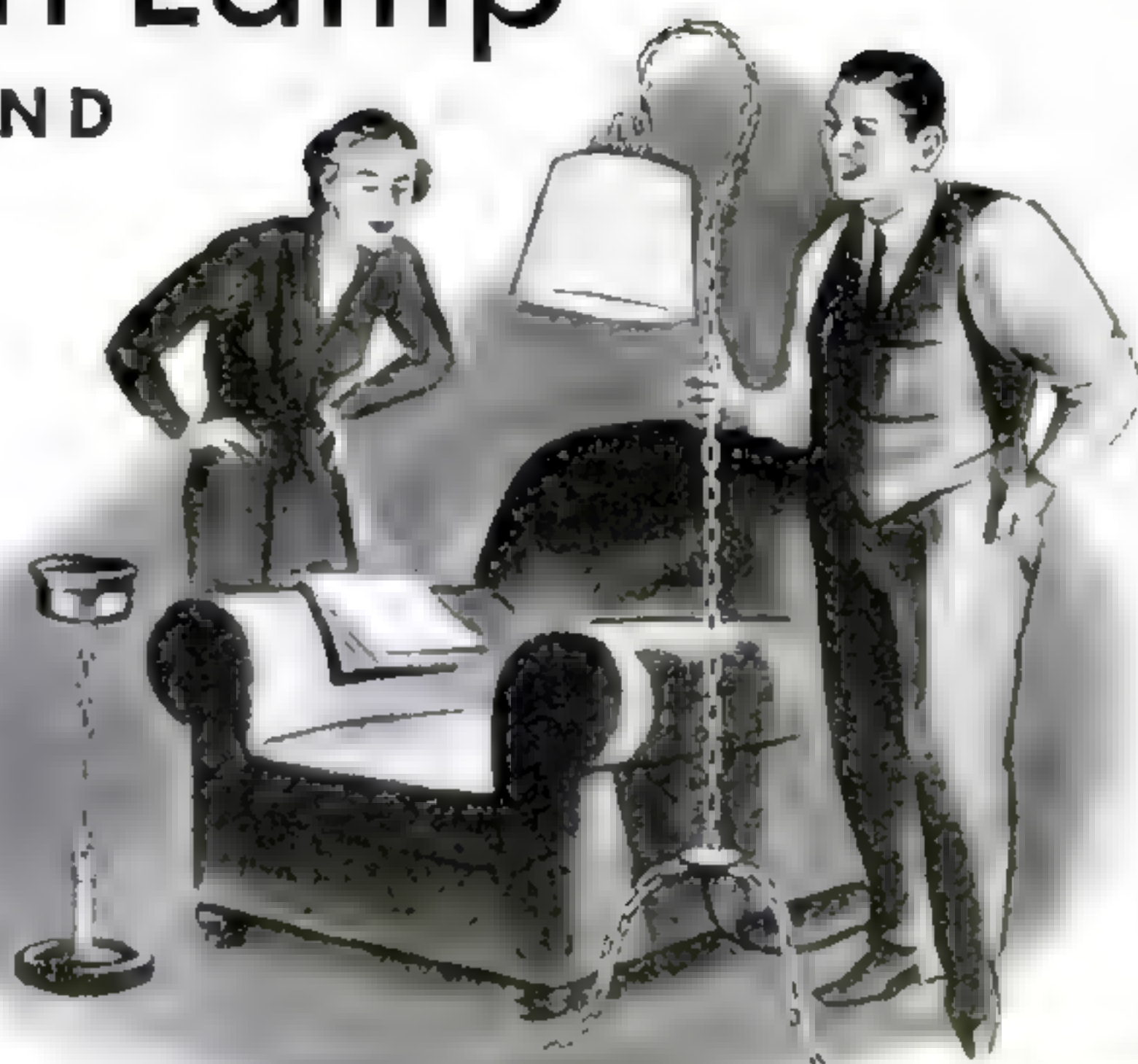


# Mystic Chain Lamp

## AND SMOKING STAND



For curved shapes, a jig is made and the chain wired to it so that the links may be brazed together

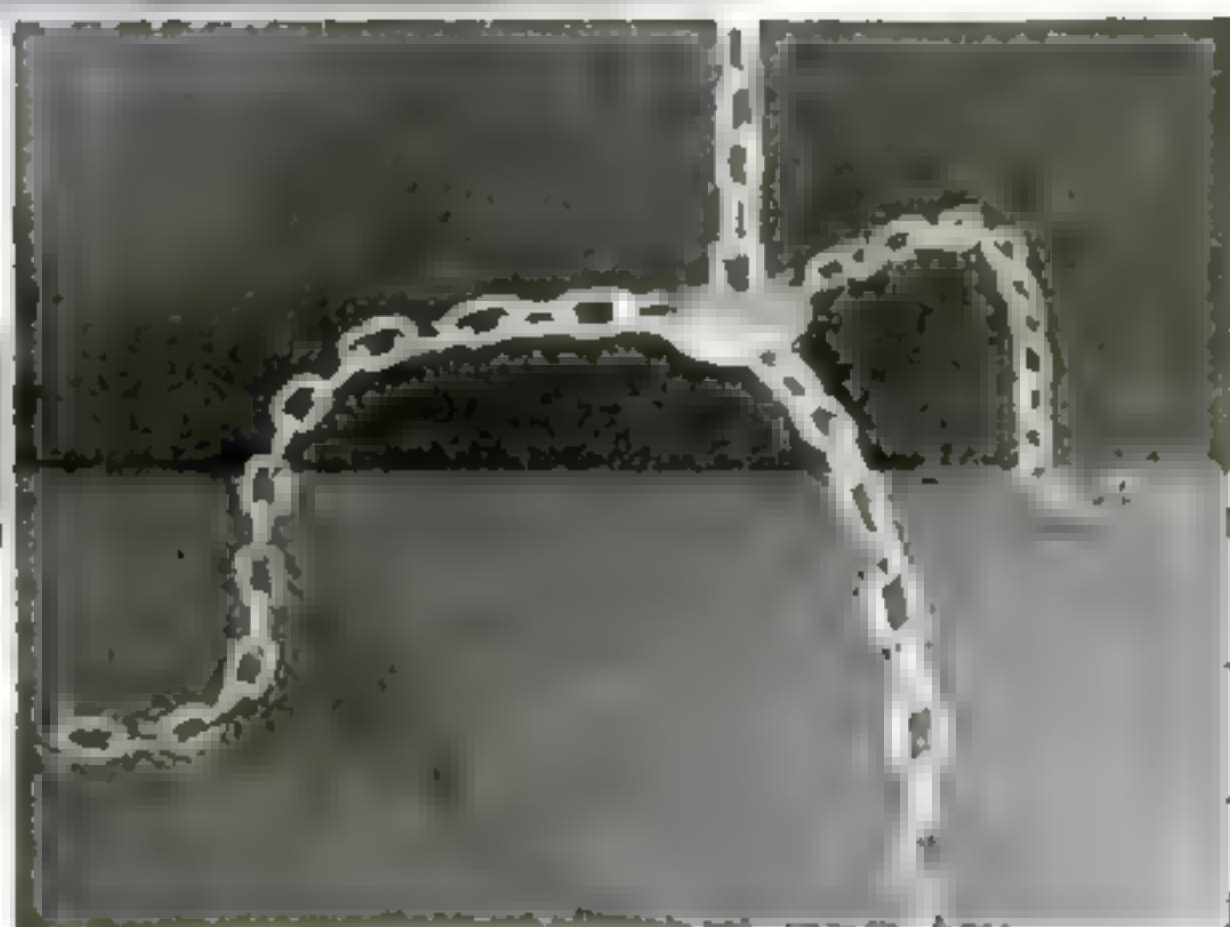
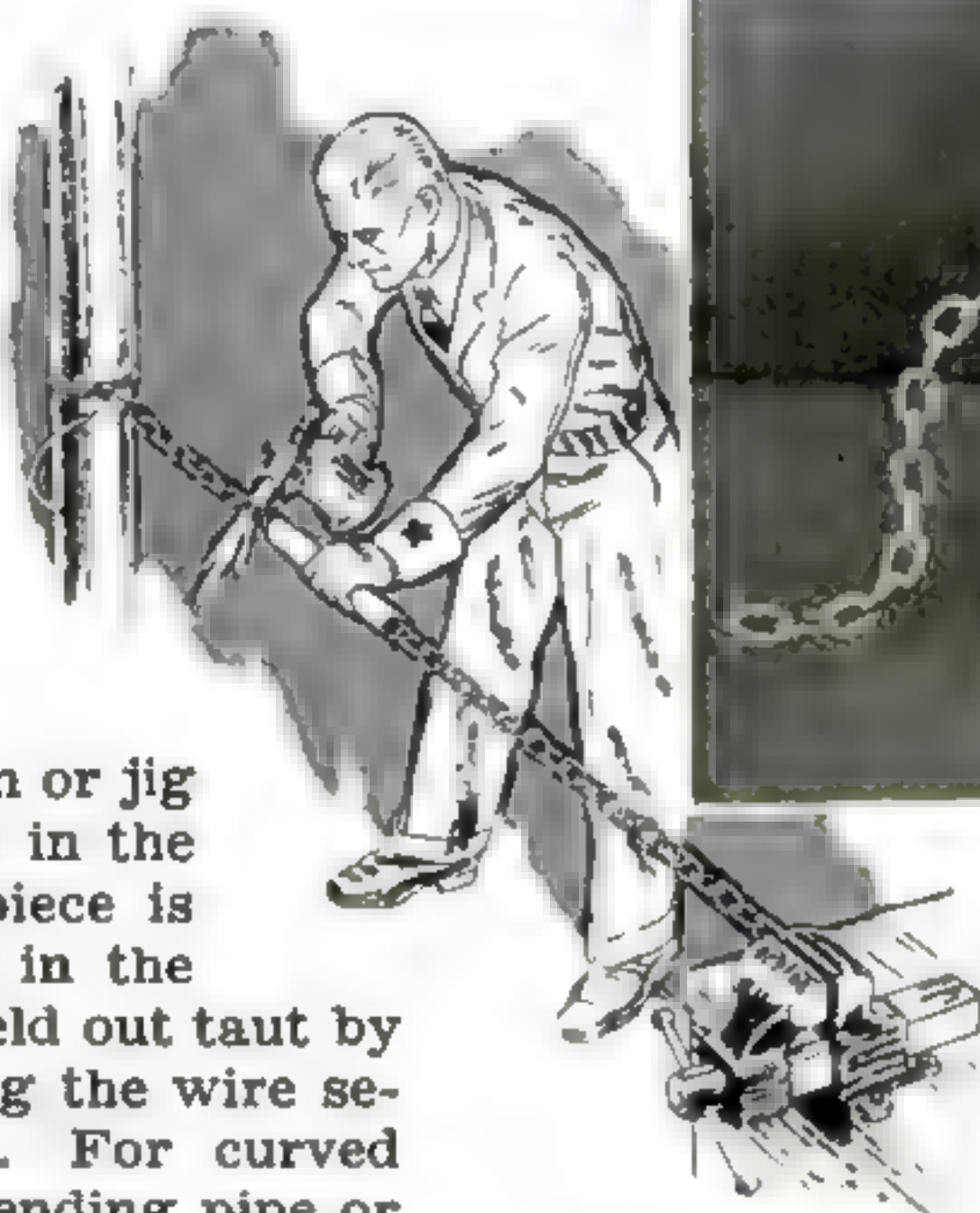


**M**ADE from ordinary iron chain, a floor lamp, smoking stand, or other novelties of the type illustrated always arouse curiosity. The secret of making the chain stand up is to braze each of the links carefully.

The chain must be thoroughly cleaned with steel wool or by dipping it in a dilute solution of hydrochloric or sulphuric acid. A crude form or jig is then made to hold the chain in the desired shape. If a straight piece is required, one end may be put in the bench vise and the other end held out taut by fastening a wire to it and tying the wire securely to some solid support. For curved parts, a jig may be made by bending pipe or rod to the desired shape.

Although an acetylene welding torch is desirable, the brazing can be done with a good gasoline blowtorch. Place sheet asbestos around the link to be brazed, and apply a liberal amount of borax-and-water paste as a flux. After heating for a minute or two, place small scraps or filings of brass on the link. When the chain and brass reach the proper temperature, the brass will flow into the link. The joint then may be allowed to cool. It may be desirable in some cases to build up the joint by flowing in additional brass.

Where the legs of the floor lamp meet the upright chain, a solid iron piece is used. The end links are cut in the middle, fitted into holes drilled in the iron, and brazed. The base and ash-tray support for the smoking stand are turned from wood, and parts of swivel joints



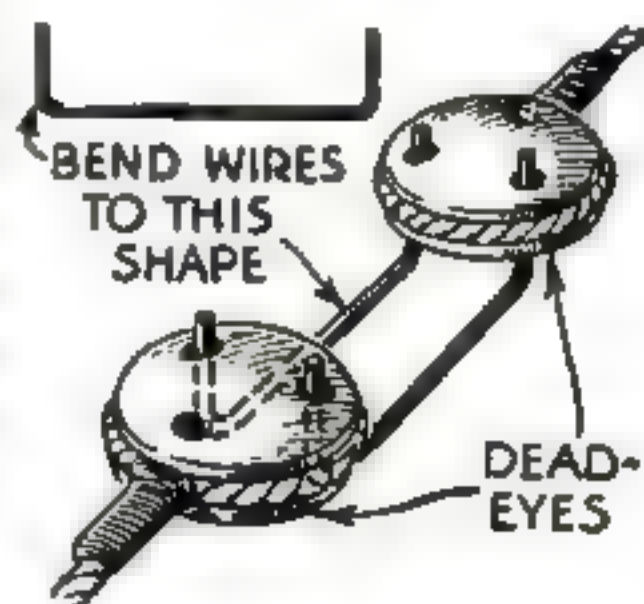
The chain stands up as if by magic. Left, how the straight pieces are brazed

are used as connections at the top and bottom.

The projects illustrated were finished in gold paint. If preferred, they might be painted black and then silver or gold powder blown on at various places before the paint begins to dry.—PERRY HYAMS and C. C. COOLEY.

## Lining Up Model Deadeyes

SHIP-MODEL deadeyes may be lined up more easily in order to start threading the lanyards through their holes if two wires are bent as shown to hold them the correct distance apart. The bent-over ends are pushed into the deadeye holes and removed as the lanyard replaces them.—S. P. ROBBINS.





# PLANS FOR CONSTRUCTING A Pegged-Joint Bed

Is your hobby building furniture? Then why don't you let us see some of your work. Pick out the most attractive, novel, and useful piece you have made recently and prepare an article about it similar to this one. If it proves suitable for publication and the illustrations are good enough, you will be paid for it immediately.

**I**N STYLE, I call this bed "modern Colonial"—modern because of its smooth lines and purely structural use of materials, and Colonial because of its simple design, straightforward craftsmanship, and pegged joints. It takes springs of the standard double-bed width. If springs of another size are used, change the dimensions to suit.

The wood to be used is largely a matter of choice. For a natural finish, maple is, of course, ideal. If an enamel finish is to be used, birch takes paint well and has the advantage of being strong and hard, but a softer wood such as whitewood is also quite satisfactory.

Enlarge the patterns for the posts to full size, lay them out, all four of them, on 2" by 6" stock, and cut them to shape. The mortises

for the long rails begin 8" from the bottom of the posts and 2" from the inside edge. The mortises for the front and back bottom rails begin 5" from the bottom of the posts and are 1" deep. The rails themselves are  $\frac{3}{4}$ " by 3" by 4' 3" long and fastened with short screws driven into the tenons.

The front and back upper rails, which are of 2" by 3" stock and 4' 5" long, are joined to the posts as shown and fastened with long screws driven diagonally. These screw heads are countersunk and concealed with glued wooden plugs. Don't attempt to round the tops of the upper rails into the curve of the posts until after the parts are assembled.

The side rails,  $\frac{3}{4}$ " by 7 $\frac{1}{2}$ " by 6' 10", have double tenons at each end as indicated. The strips of  $\frac{3}{4}$ " by 2" stock are fastened along the bottom of each to hold the bed springs. The holes for the pegs or draw pins are  $\frac{3}{4}$ " in diameter and taper in from the outside about  $\frac{1}{4}$ " so the pins will draw the frame members snugly together. The draw pins are made from a dowel and are 2" long.

The bed may be finished either with stain or varnish or with enamel, as desired.

The charm of this unusual design lies in its simplicity and excellent proportions

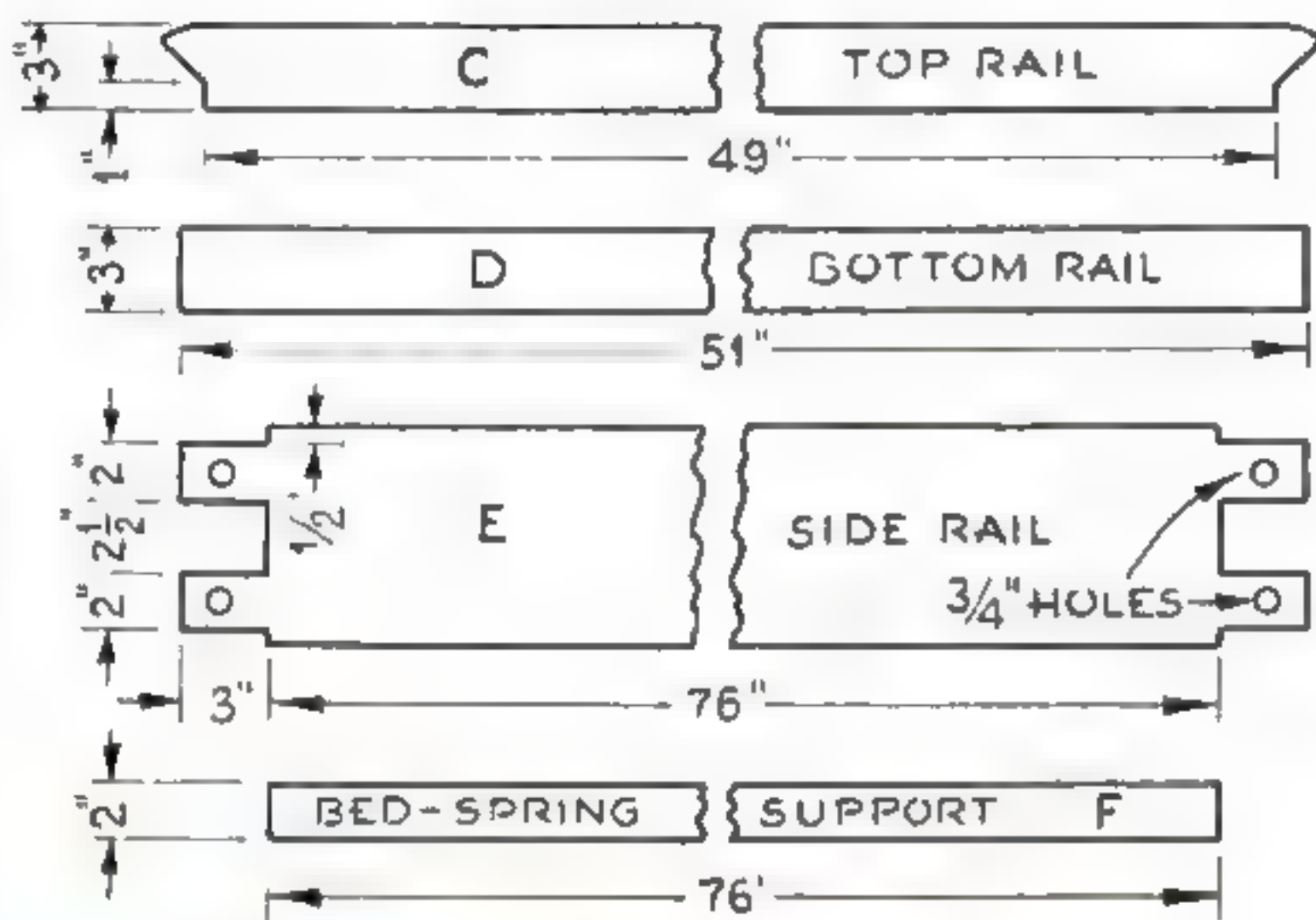
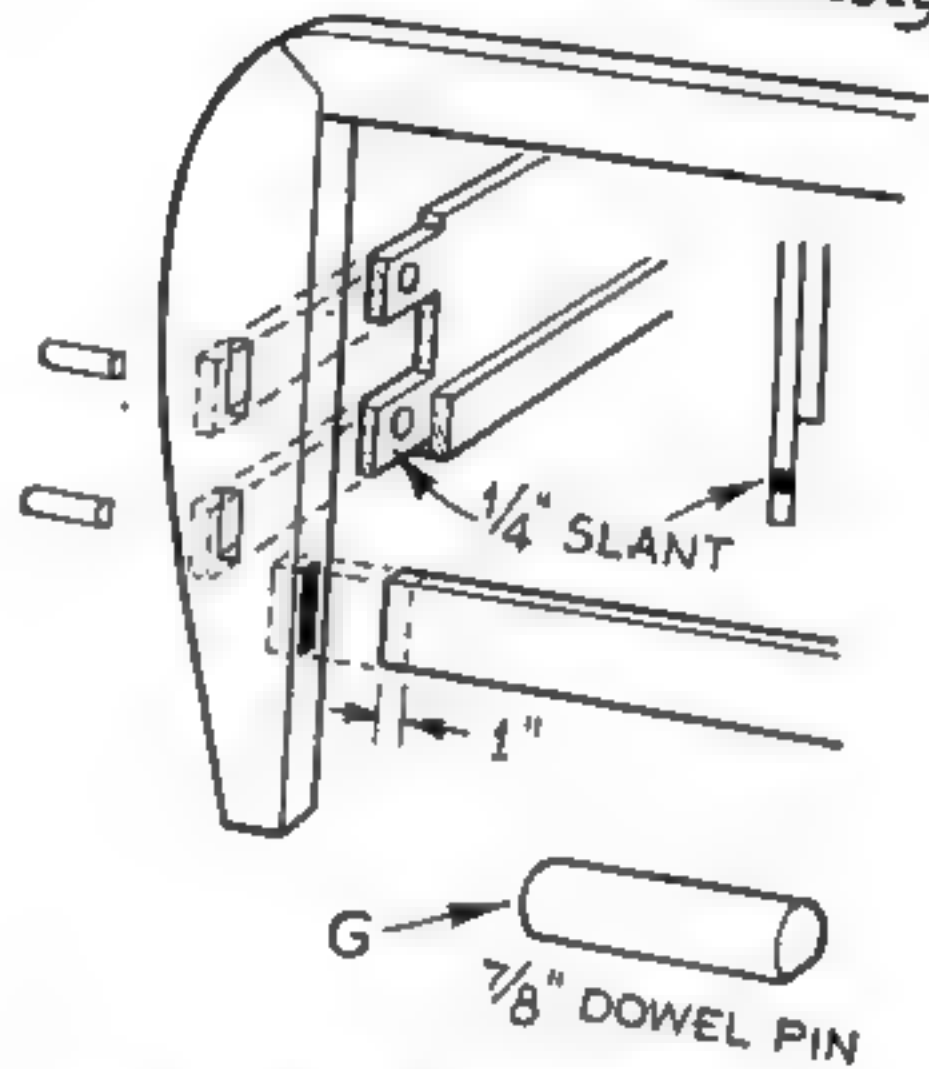
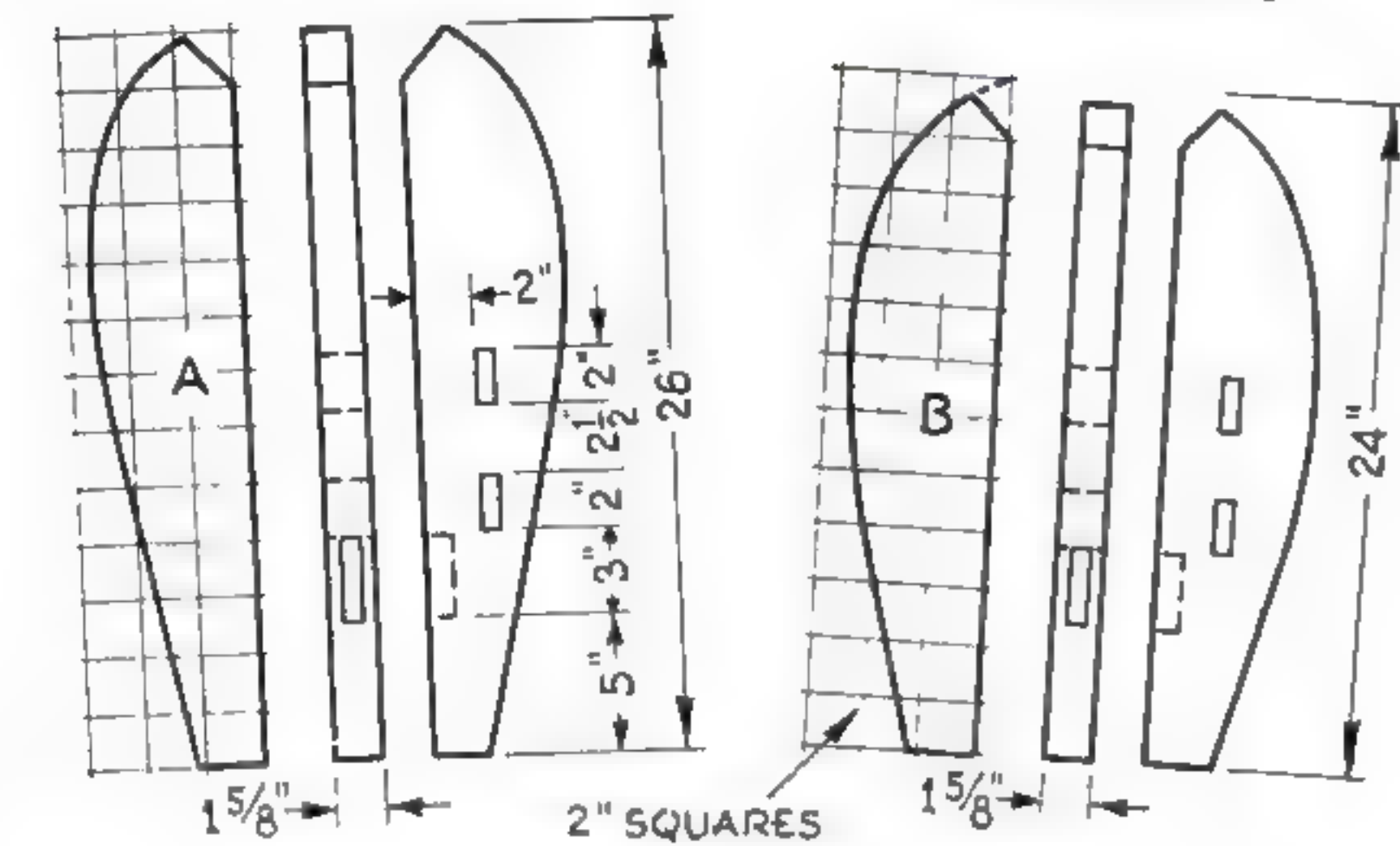




# HEADBOARD

# FOOTBOARD

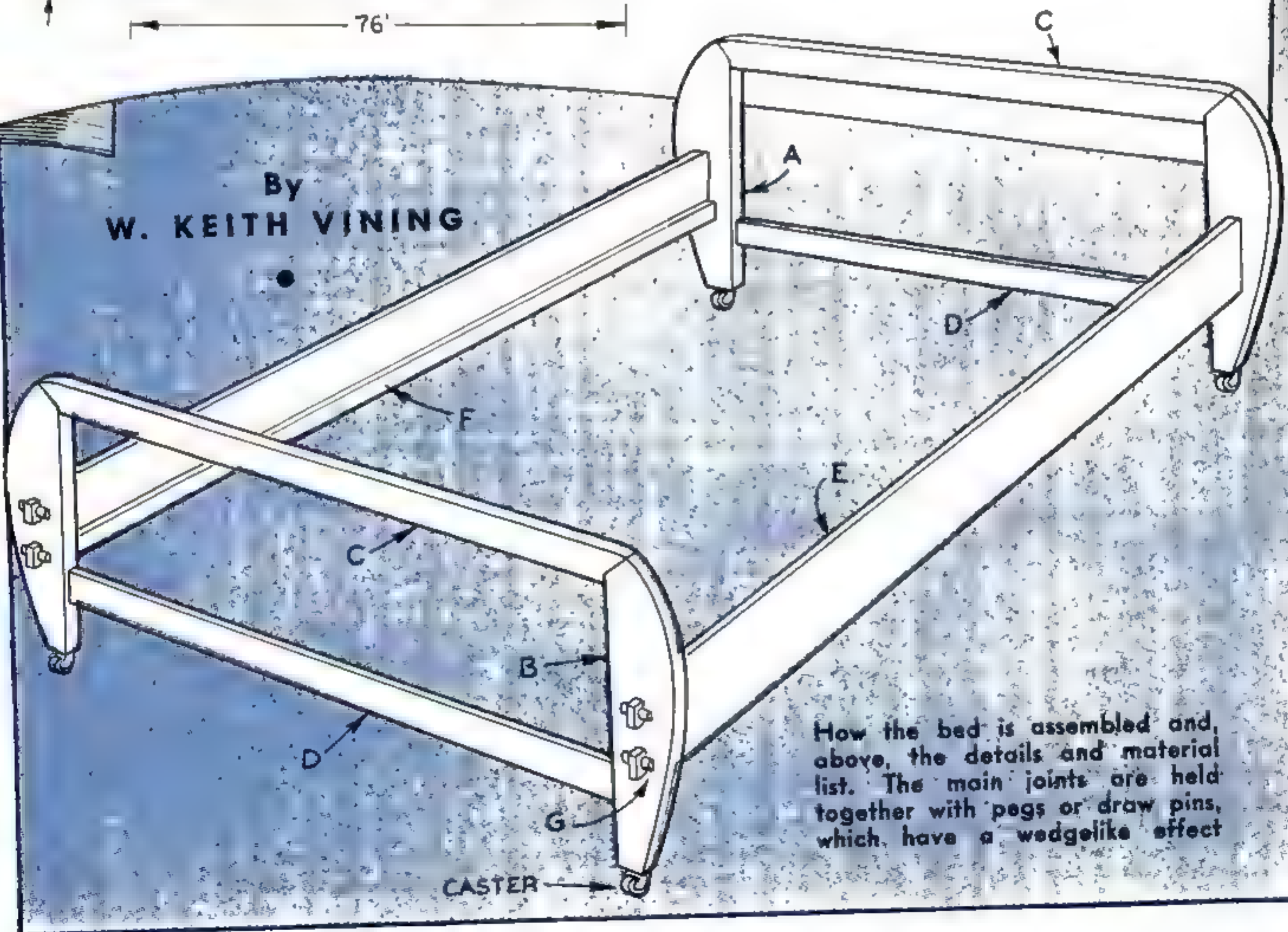
# Method of Assembly



# List of Materials

- A, B - 1 PIECE 2" x 6" x 8'-6"
- C - 1 PIECE 2" x 3" x 8'-10"
- D - 1 PIECE 3/4" x 3" x 8'-10"
- E - 2 PIECES 3/4" x 7 1/2" x 7'-0"
- F - 2 PIECES 3/4" x 2" x 6'-4"
- G - 1 PIECE 7/8" HARDWOOD DOWEL, 1'-6" LONG
- 4 HEAVY FLATHEAD SCREWS 4" LONG
- 2 DOZEN FLATHEAD SCREWS 1 1/4" LONG
- 4 MEDIUM-SIZE BED CASTERS

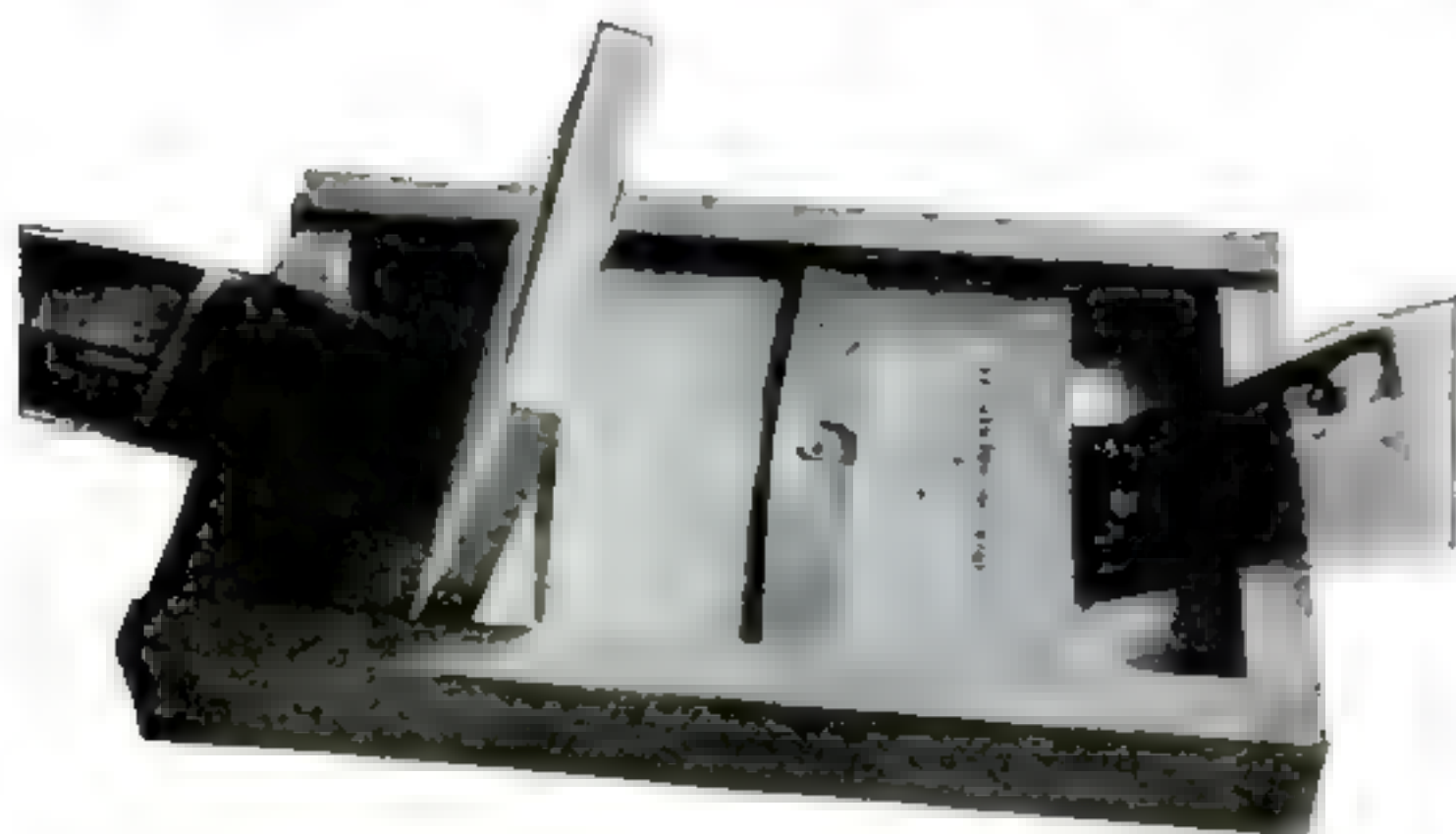
By  
W. KEITH VINING



How the bed is assembled and, above, the details and material list. The main joints are held together with pegs or draw pins, which, have a wedgelike effect

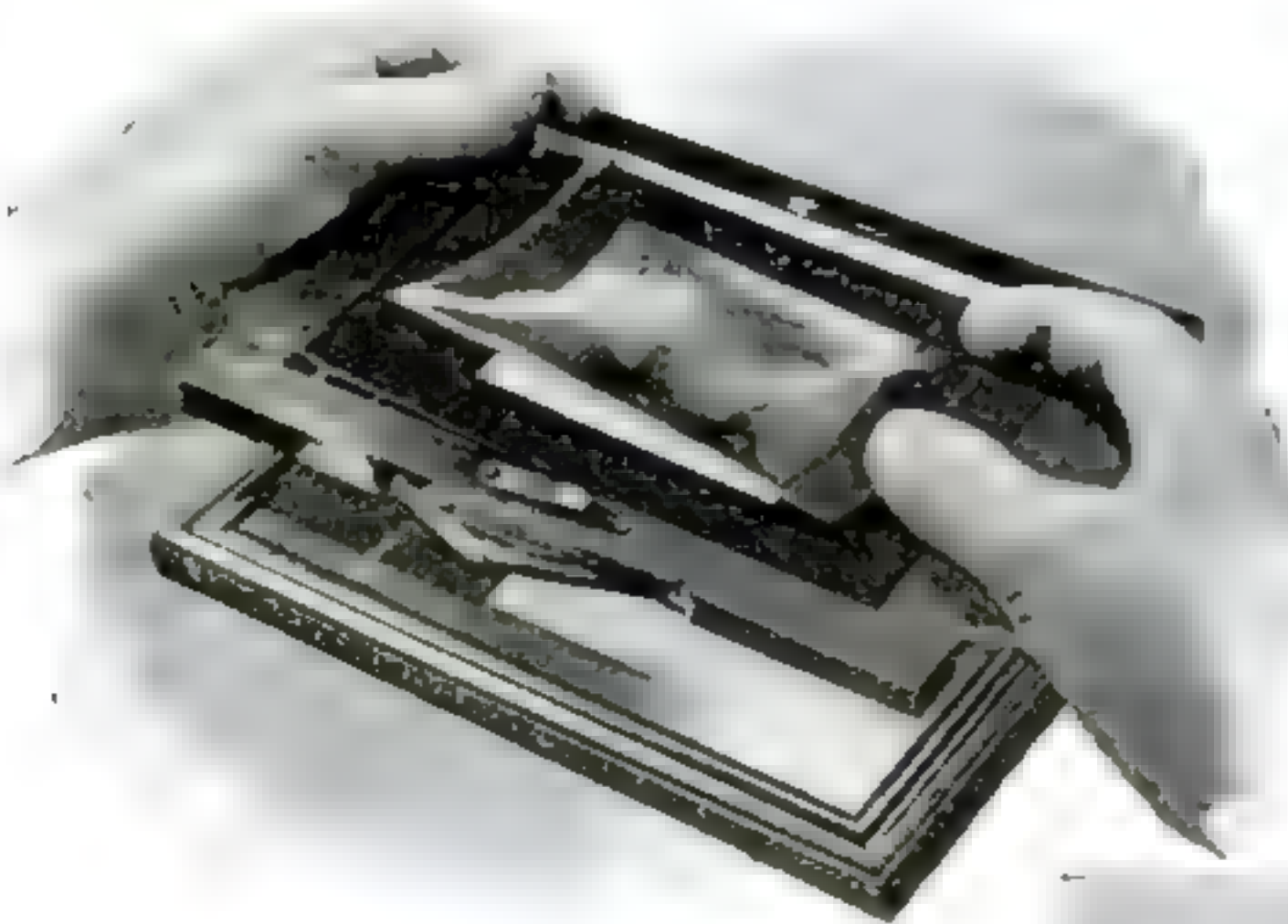


# Timesaving Hints for



## Printing Uncut Roll Film in an Ordinary Frame

AMATEUR photographers at times wish to make prints from roll film without cutting the individual pictures apart. This can be done without a special frame by using an ordinary printing frame at least twice as long as the picture. Pressure is applied with the larger section of the back, as shown, and there is then sufficient room at each end for the film to pass through without danger of becoming creased.—JOHN M. AVERY.



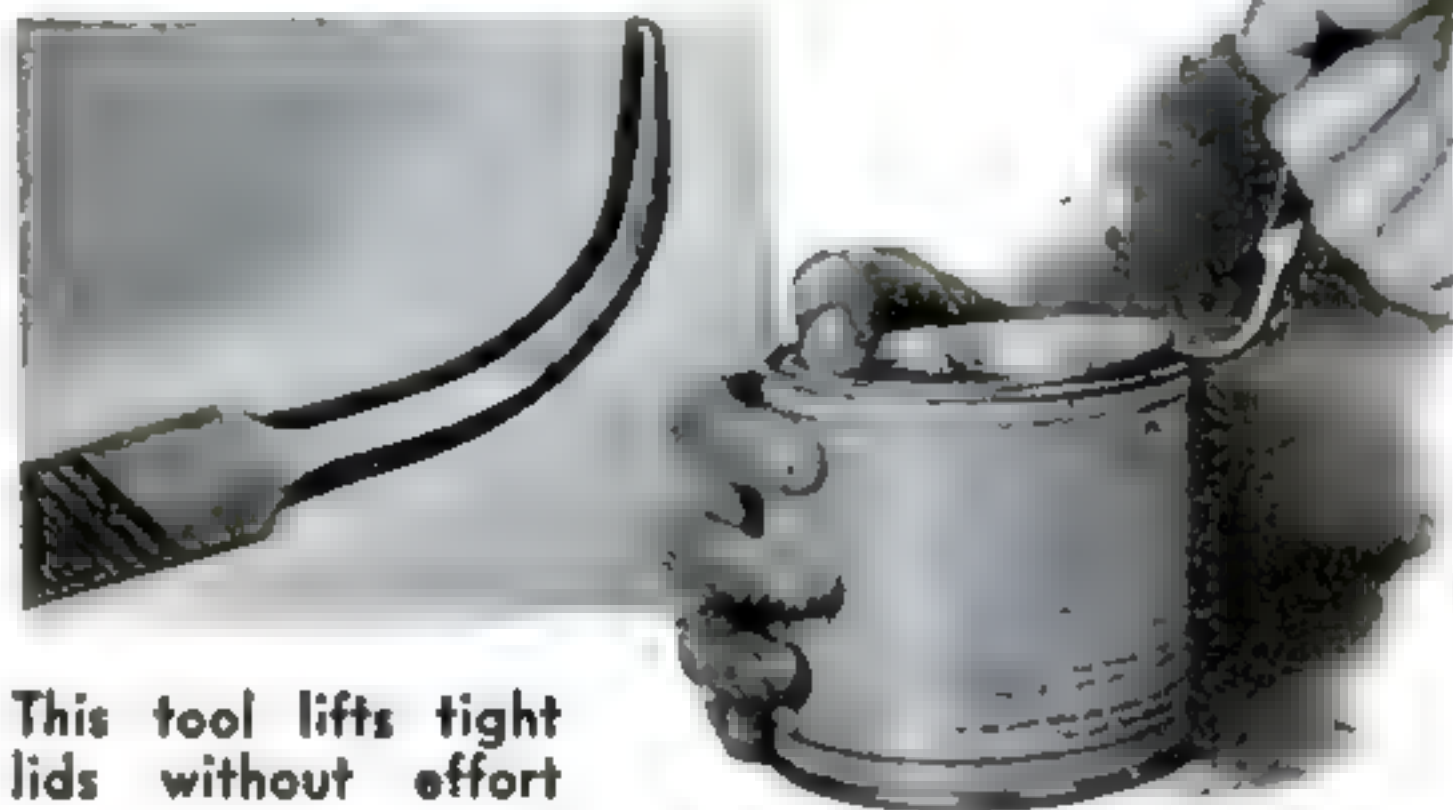
## Watch Hung Outside Darkroom Keyhole

IN ORDER to tell the time when developing panchromatic film in total darkness, one photographer fastens his watch outside the keyhole of the darkroom door as shown at the right so he can peer at it through the keyhole. A towel is draped over the inner door knob to keep out all light, but arranged so the folds may be parted.—MORRIS KATZ.



## Bent File Tang Pries Up Developer-Can Lids

TO OPEN hermetically sealed cans of photographic developing powders, it is better to make a special lid lifter from an old file than to have to hunt around for something suitable and perhaps end up by ruining the handle of a good teaspoon. Snap off about  $\frac{1}{2}$ " of the tang, heat the remainder in a gas flame, and hammer it to the required thickness. Then reheat the end and bend it with pliers. Heat it once more, cool it in the air for a few seconds, and plunge it into cold water.—NATHAN SPERBER.



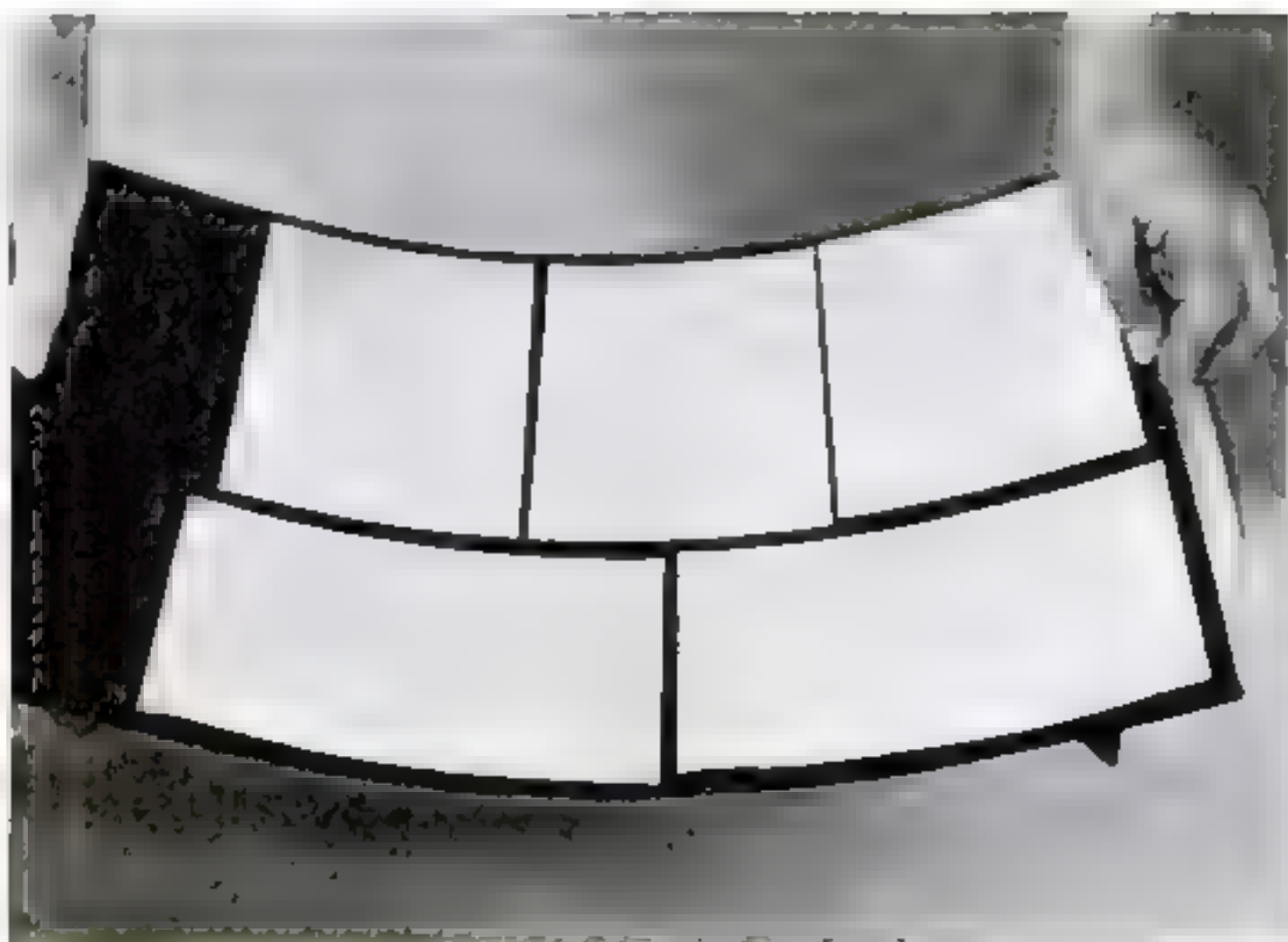
This tool lifts tight lids without effort

## Mirror Aids in Centering a Film To Be Enlarged

IF THE negative holder of an enlarger is held over a mirror lying face upward as shown at the left, it is much easier to center the negative accurately over the mask. The mirror reflects sufficient light through the mask opening to make it visible.—W. K.



# Home Photographers

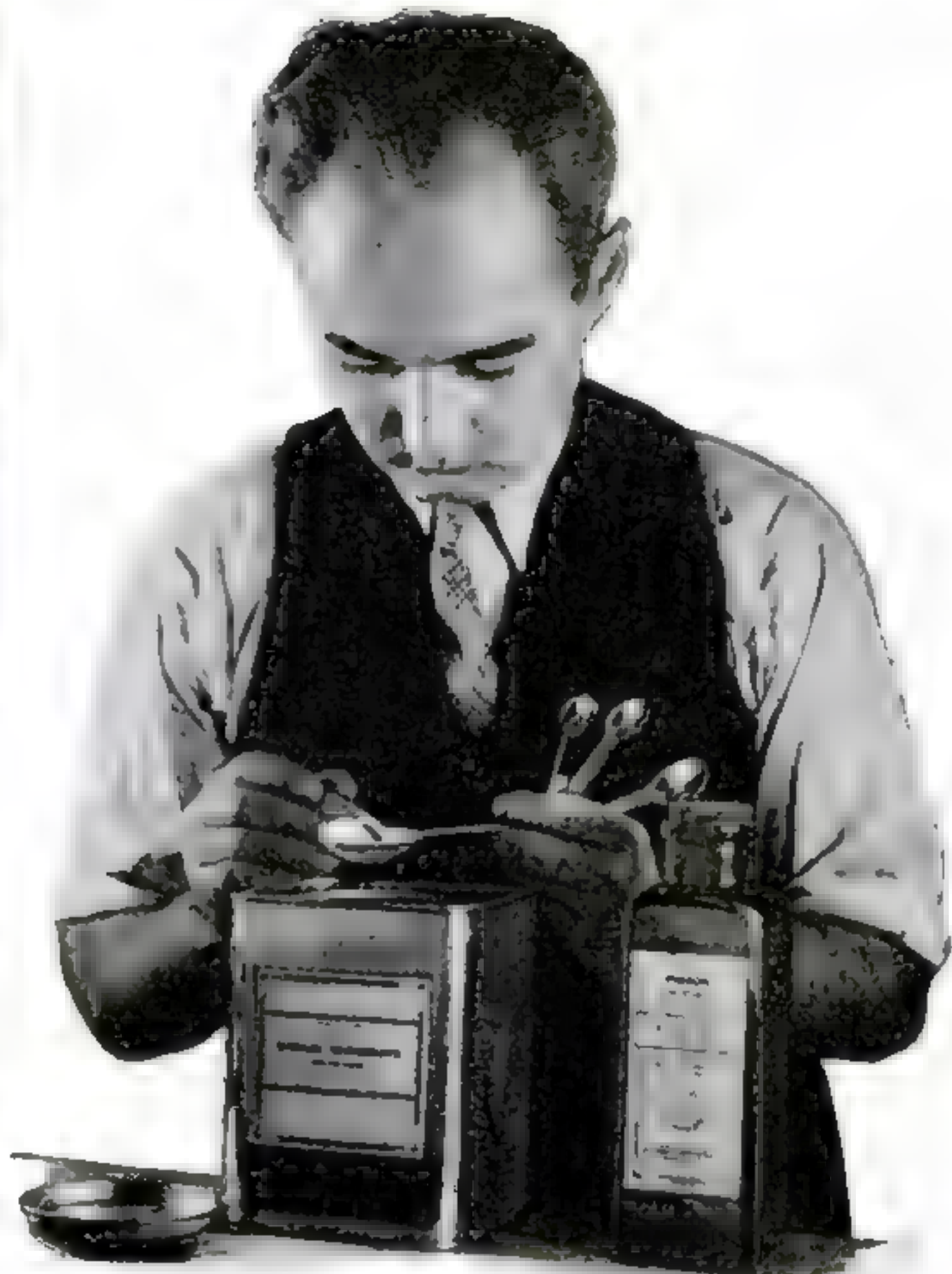
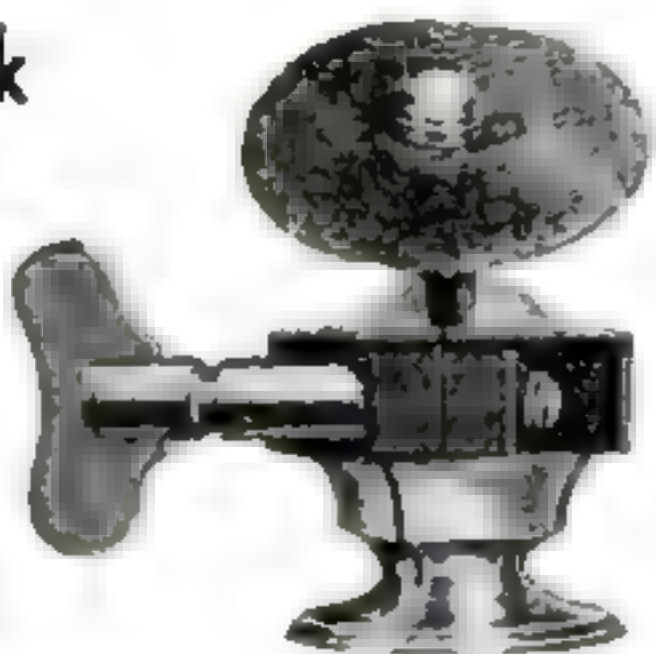


## Curved Ferrotypes Plate Gives Flatter Prints

BY BENDING a ferrotypes tin to a gentle curve as shown above before placing the wet prints on it, and maintaining the curve by any convenient means until they are thoroughly dry, you can overcome their tendency to curl when taken off the plate.—G. S. G.

## Tilt Top Improved with Felt Disk

LOW-PRICED camera tilt tops, which are unpadded, gradually indent the leather near the tripod sockets and cause wear. To prevent this, cut a suitable disk of felt from an old hat or a piece of soft plush and make a hole in the center. Apply cellulose household cement to the disk, let it dry for fifteen minutes, then apply another coat of cement to it and also to the metal, and clamp overnight.



## Photo Chemicals Measured with Set of Spoons

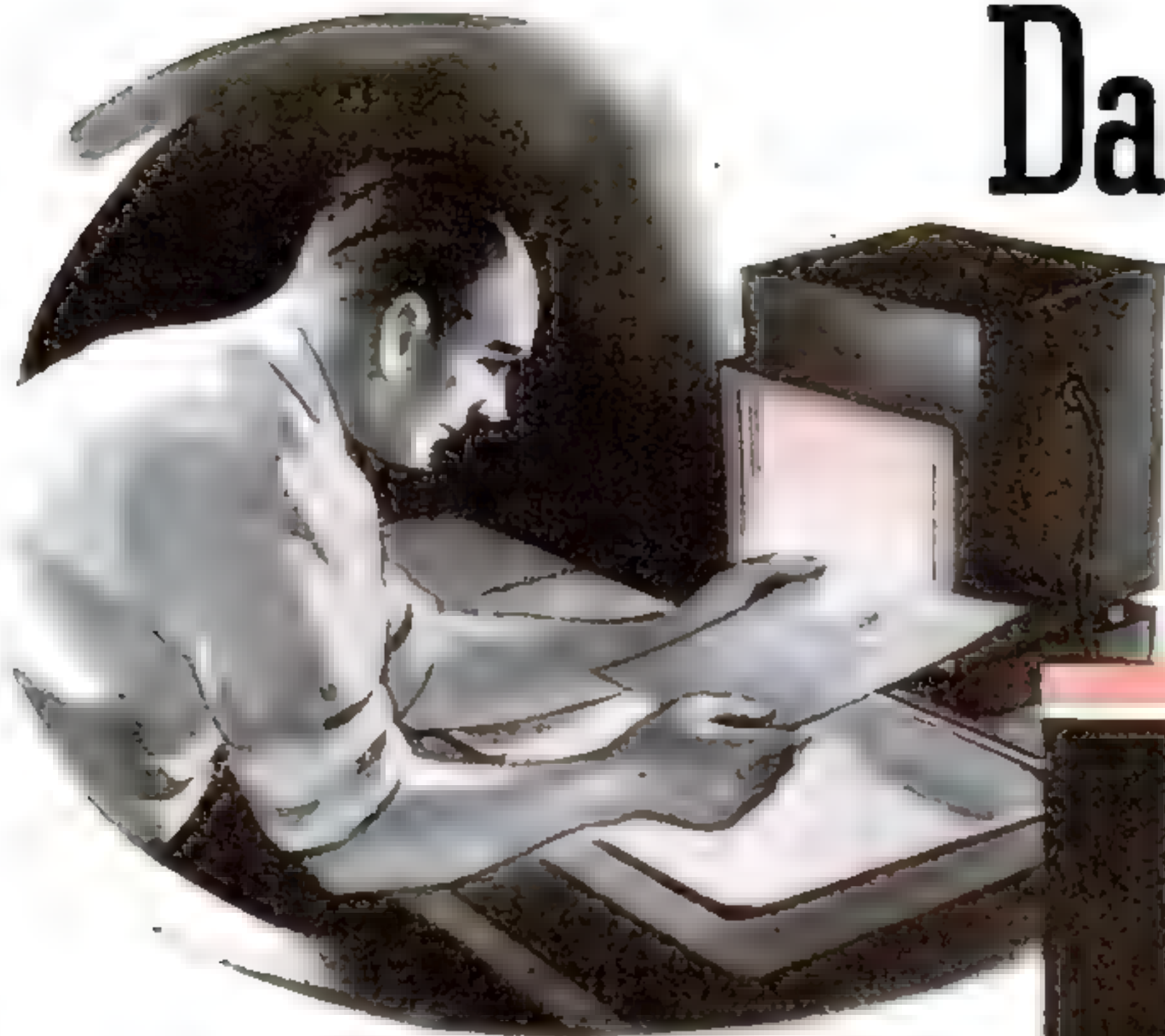
WHEN photographic formulas have to be made up frequently, much time can be saved by the use of a ten-cent set of aluminum measuring spoons. Weigh out the required amount of each chemical and see which spoon will hold it. The handle should then be marked with the quantity it will hold, in grains or fractions of an ounce. This can be done by writing with olive oil, after which the aluminum is heated.—C. L.

## Luminous Shutter Markings Aid in Night Photos

FOR setting his camera shutter at night, a midwestern news photographer made a dot on each pointer and at each figure on the dial of the shutter with luminous paint as at the left. The paint may be purchased in small bottles, or you can grind up the material found in a ten-cent luminous light pendant and mix it with a little varnish.—E. V. B.







# Darkroom

## Safe Light

HAS MANY USES

Unlike many homemade darkroom lamps, this one has the advantage of using standard safe-light glasses

**A**LTHOUGH it takes up little space in the darkroom, this utility light box, besides acting as a conventional safe light, assists the photographer in tasks for which several separate contrivances ordinarily would be required.

The sketch gives details and sizes for the box, which is constructed from  $\frac{1}{4}$ " plywood. Do not fasten the back permanently, but hinge or screw it in place so it may be removed for ventilation when negatives are being retouched. This will prevent them from overheating and curling. Strips nailed to the inside form a light trap.

The wider of the two slots in the molding on the front of the box is for the regular 5" by 7" safe lights or a sheet of flashed opal glass, while the narrow slot allows the insertion of cardboard cut-outs for special purposes.

As the box will be used in various positions, a locking arrangement is provided for the movable piece of molding. This is merely a nail that fits in a hole through the top and side-piece. The lock is positive in action, yet is quickly opened for changing slides. If no dado head is available for slotting the molding, cardboard spacers and thin wood strips nailed together will answer very well.

The light socket inside the box is attached by means of a threaded bushing through one end, as indicated, and is held securely by a lock nut on the outside of the box. Wires through this bushing connect the socket with the power supply. A 25-watt lamp is used with the safe lights, but for other purposes the wattage may be varied.—C. ELMER BLACK.

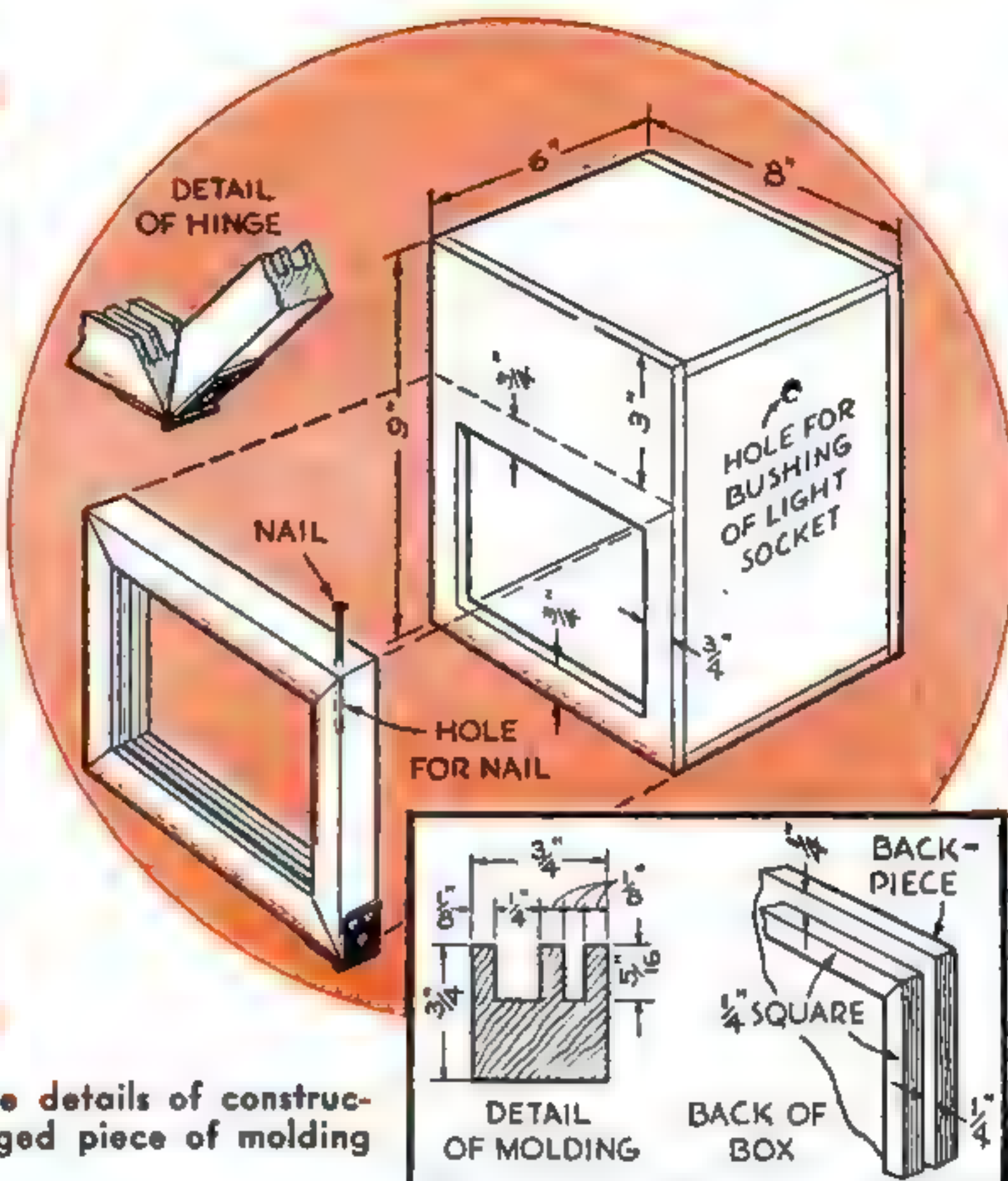
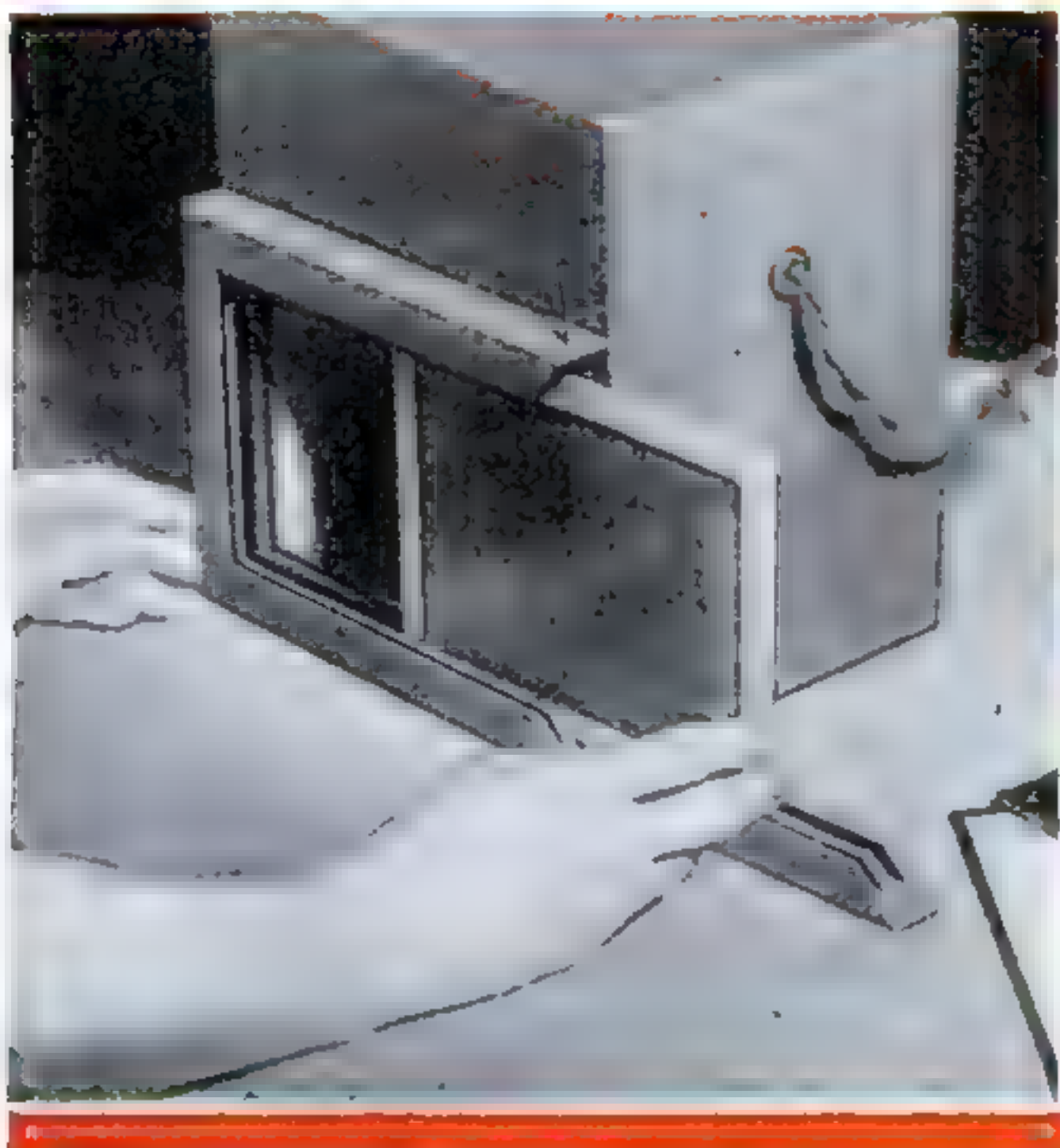


An opal glass gives a soft, white light for spotting prints and for retouching negatives



Sorting negatives according to their contrast by comparison with standard negatives pasted behind cut-outs in a cardboard mask





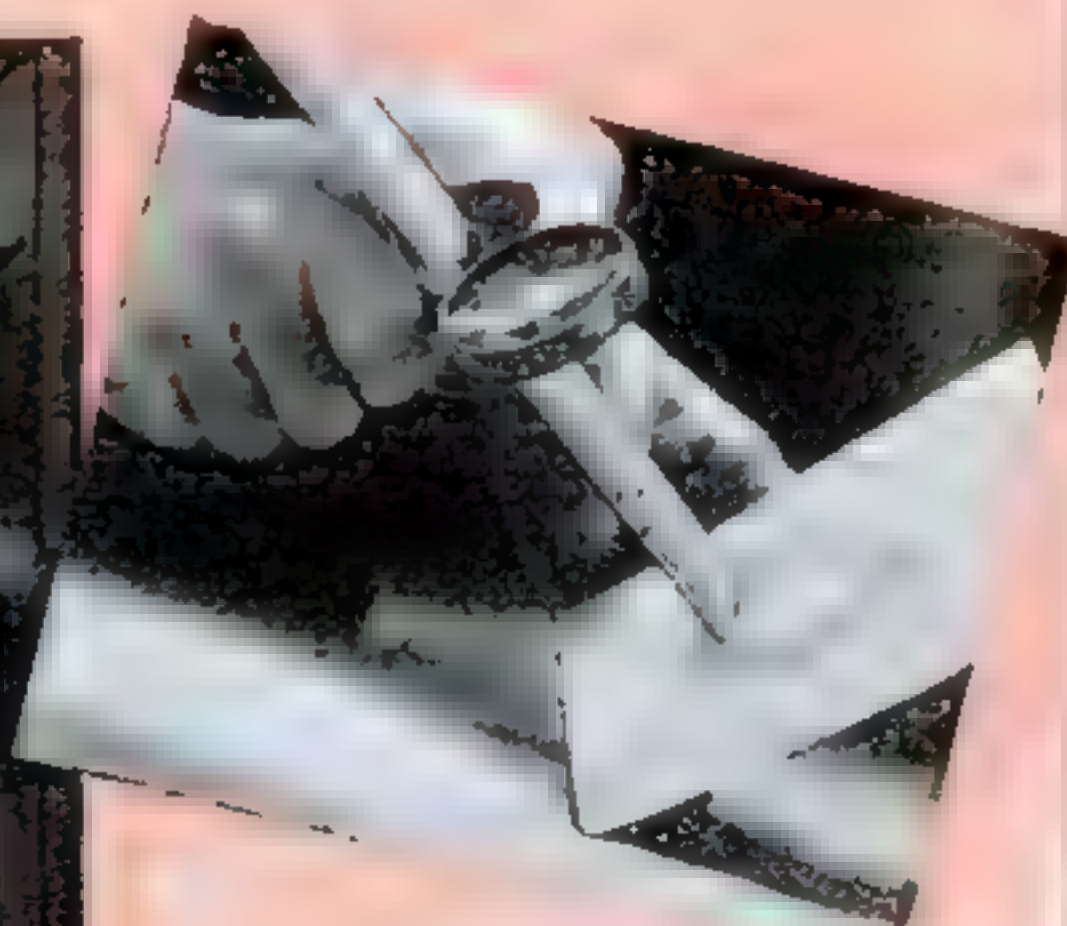
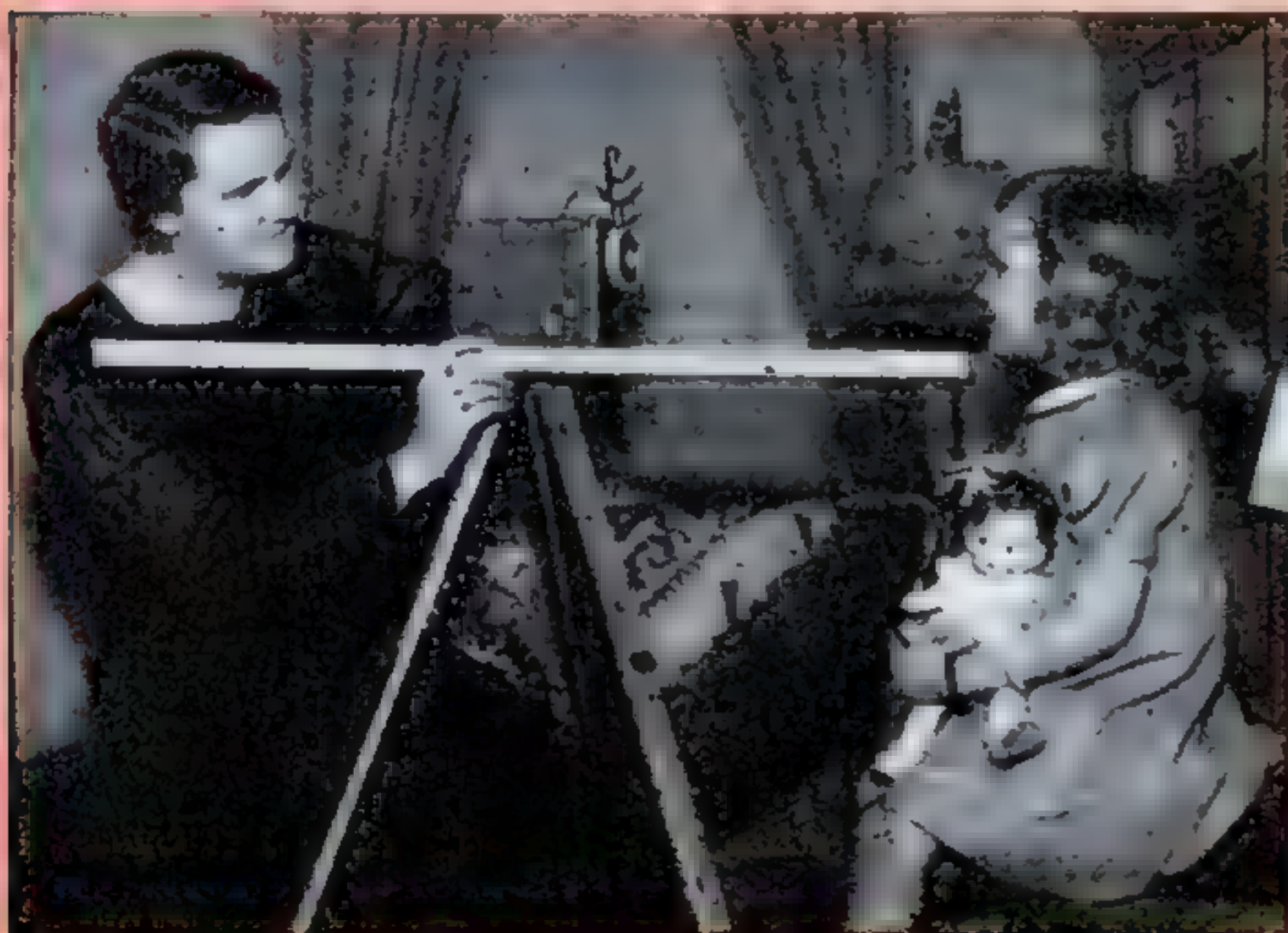
Method of inserting safe lights and the details of construction. Note the nail for locking the hinged piece of molding

## Reading Glass Used for Close-ups and Copying

LARGE images of small objects or extreme close-ups may be made with any camera by holding a reading glass in front of the camera lens while making the exposure. A fixed-focus camera will give excellent results. Only two simple rules are necessary to give sharp focus. First, find the focal length of the reading glass and hold it exactly this distance from the object which is to be photographed. Second, if the camera is a focusing model, set it on 100 feet or infinity. Place the camera lens

against the center of the reading glass and snap the picture in the usual manner.

To find the focal length of the reading glass, focus the sun to the smallest possible image and measure the distance from the center of the reading glass to the image. If the sun is not shining, focus a distant object such as a tree on a piece of white paper and measure in the same way. The view finder cannot be used so the camera must be aimed by sighting over its top and sides.—CLEMENT W. RICKMAN.



Above, finding focal length of a reading glass. At left, a glass of 20" focal length acts as a portrait attachment





## WHITTLED MODEL OF A Famous Gun

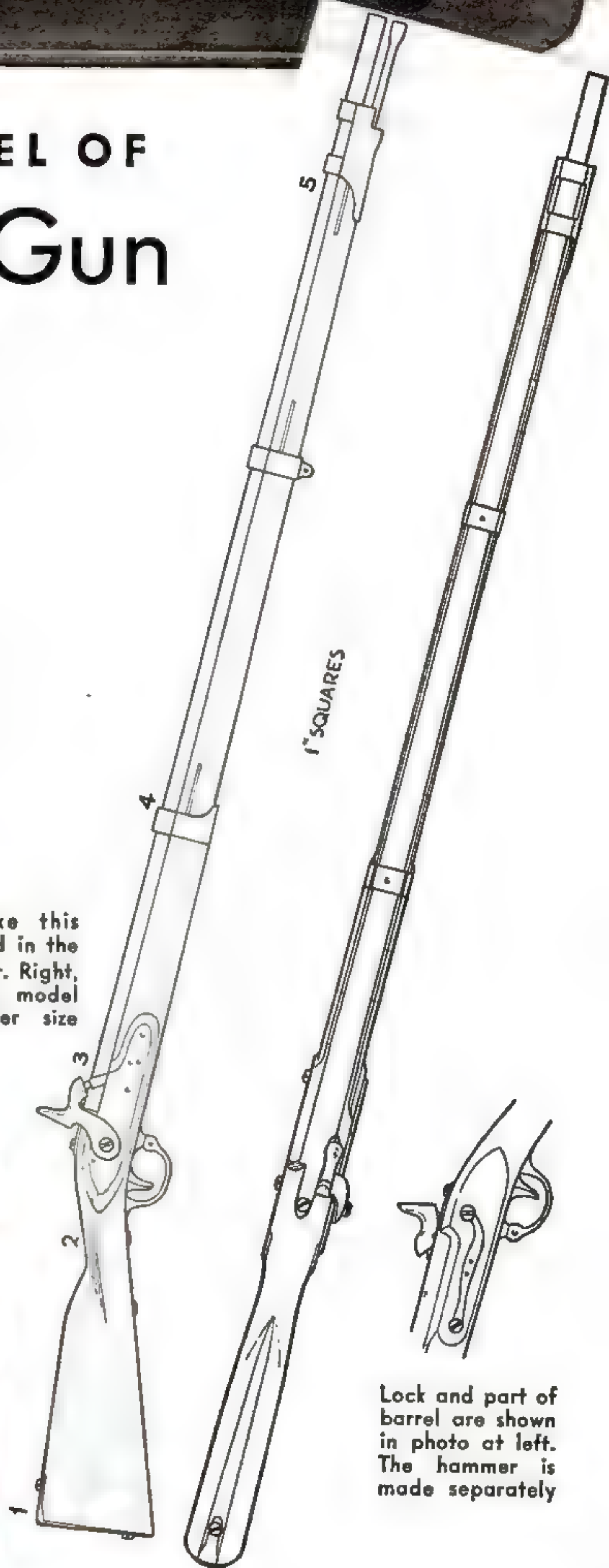
**C**ARVED from a white pine board  $1\frac{1}{8}$ " by  $4\frac{1}{2}$ " by 30", this model is a half-size copy of a picturesque gun made in the government arsenal at Harpers Ferry, W. Va., and dated 1835. The arsenal was destroyed by fire in 1861 to prevent its capture by Confederates.

Enlarge the side-view drawing to four times the size shown, transfer the outline to the wood, and jig-saw it to shape. Draw a pencil center line all around the edge before starting to carve the parts. Keep your knife very sharp so as not to tear the soft wood.

I made the hammer separately, otherwise a thicker board would be required and a great deal more waste stock would have to be whittled away. The ramrod is a particularly thin, difficult part to shape, and it may be added afterward, if preferred, by inserting the end in a hole drilled to receive it. The screw heads are cut from  $\frac{1}{4}$ "

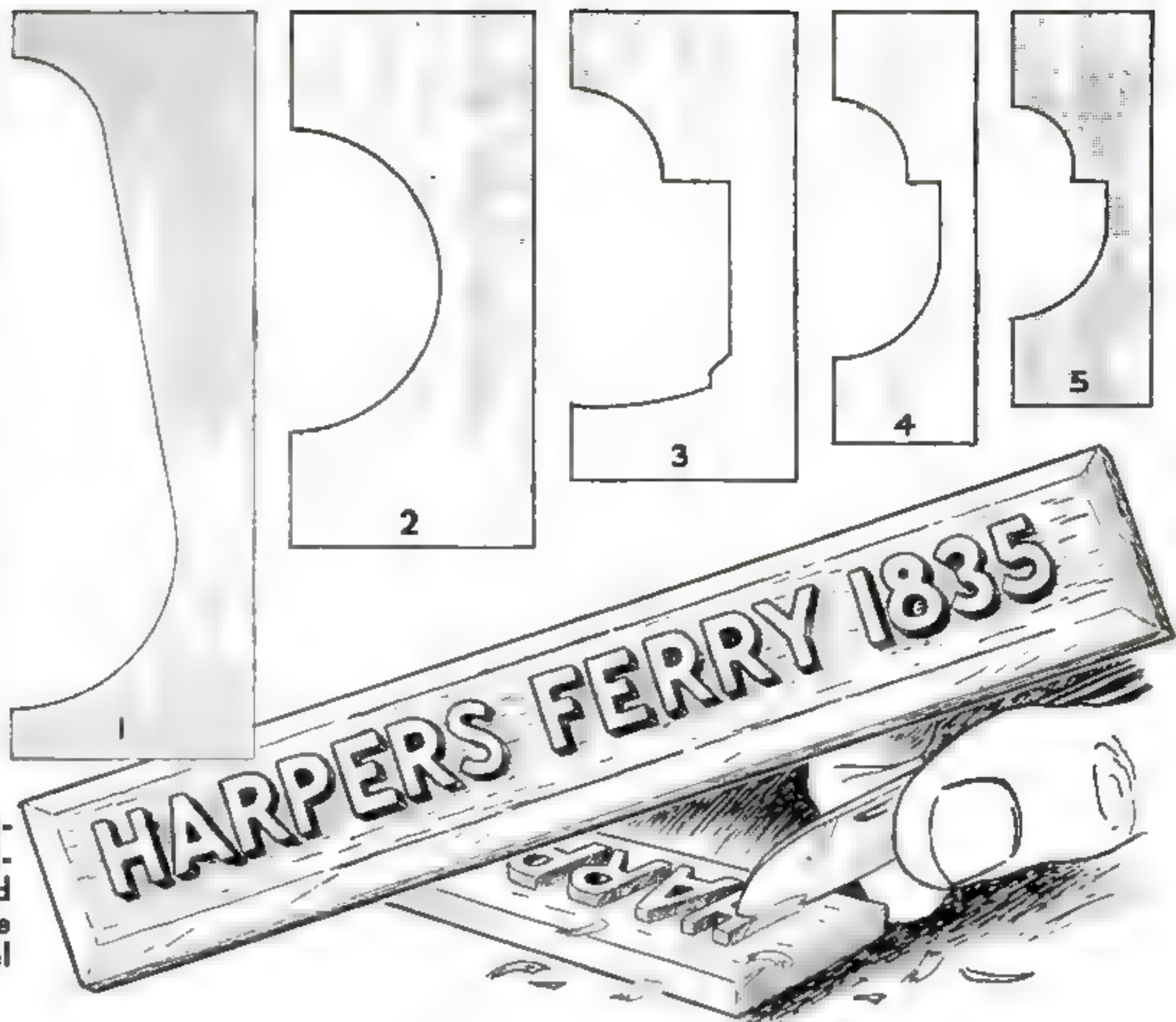
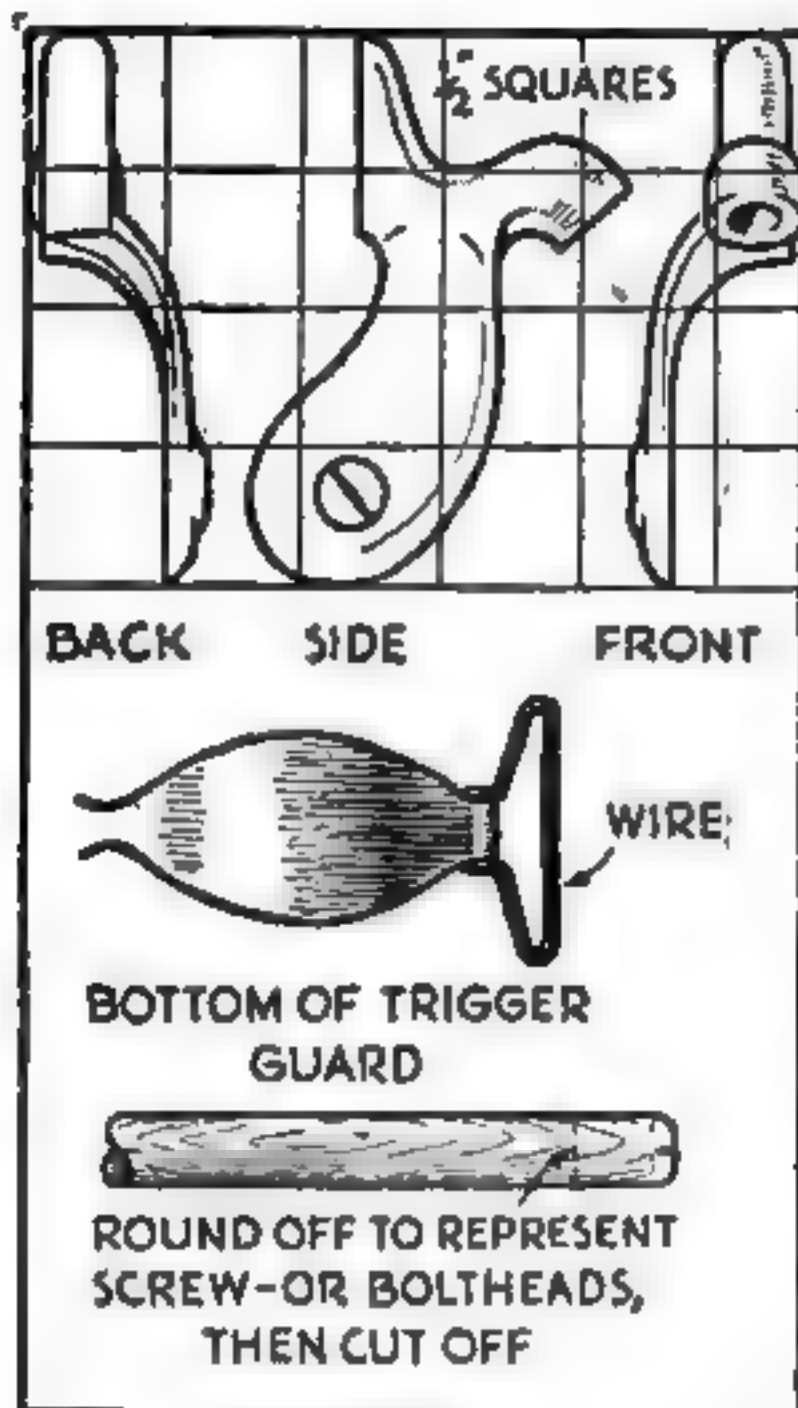
Guns like this were used in the Civil War. Right, views of model one-quarter size

By **CARL G. ERICH**



Lock and part of barrel are shown in photo at left. The hammer is made separately





Half-size details of hammer and trigger guard; full-size plans of templates and name plate. Templates are an aid in shaping the model

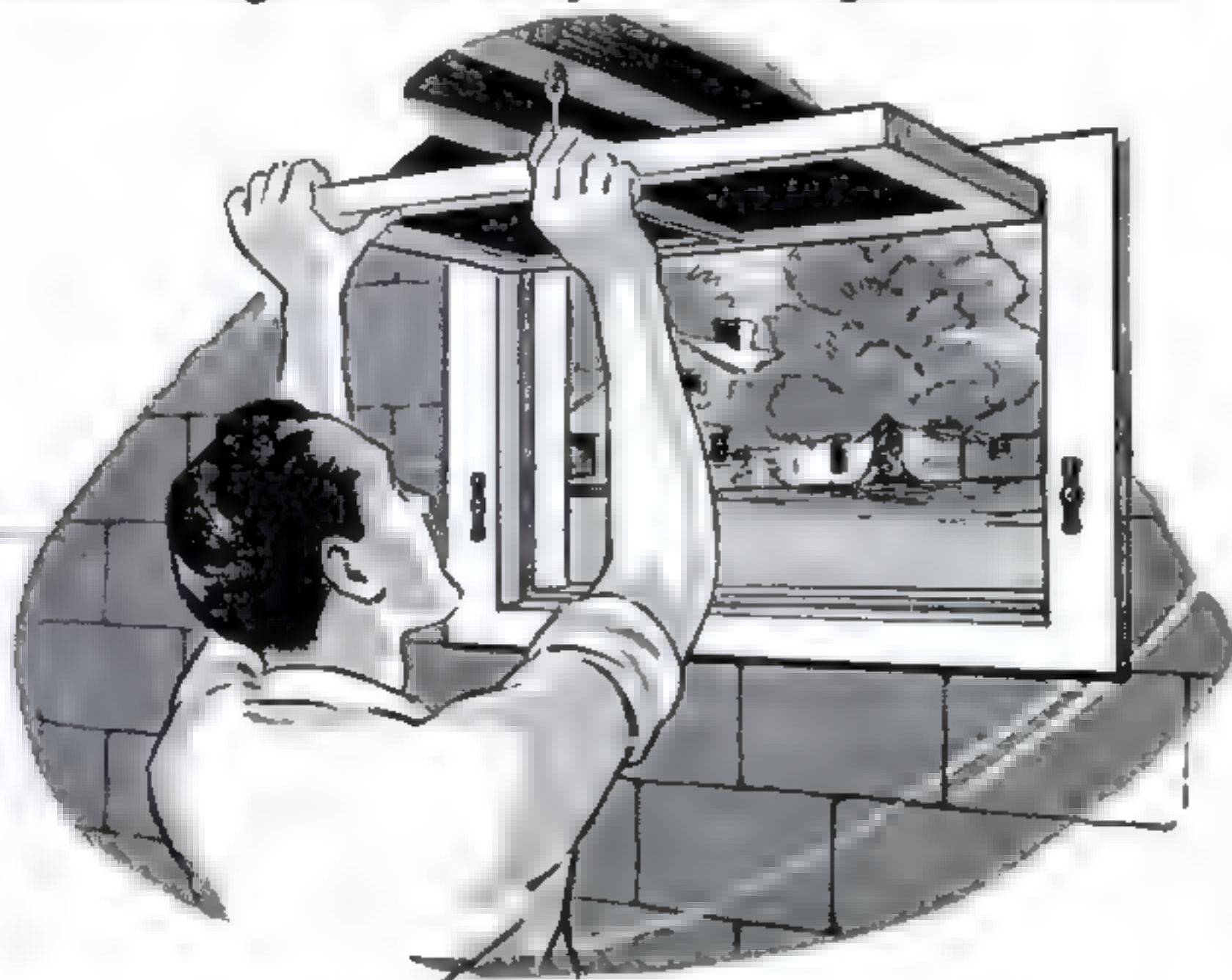
dowel sticks, although oval-head wood screws might be substituted. The left side of the gun does not have a carved plate like that on the right side.

The panel may be any shape desired. To

mount the model, insert a  $\frac{1}{4}$ " dowel in the panel at the front of the trigger guard, and another about 7" from the muzzle; then drive a small screw from the rear of the panel into the gun.

## Fastening Cellar Windows

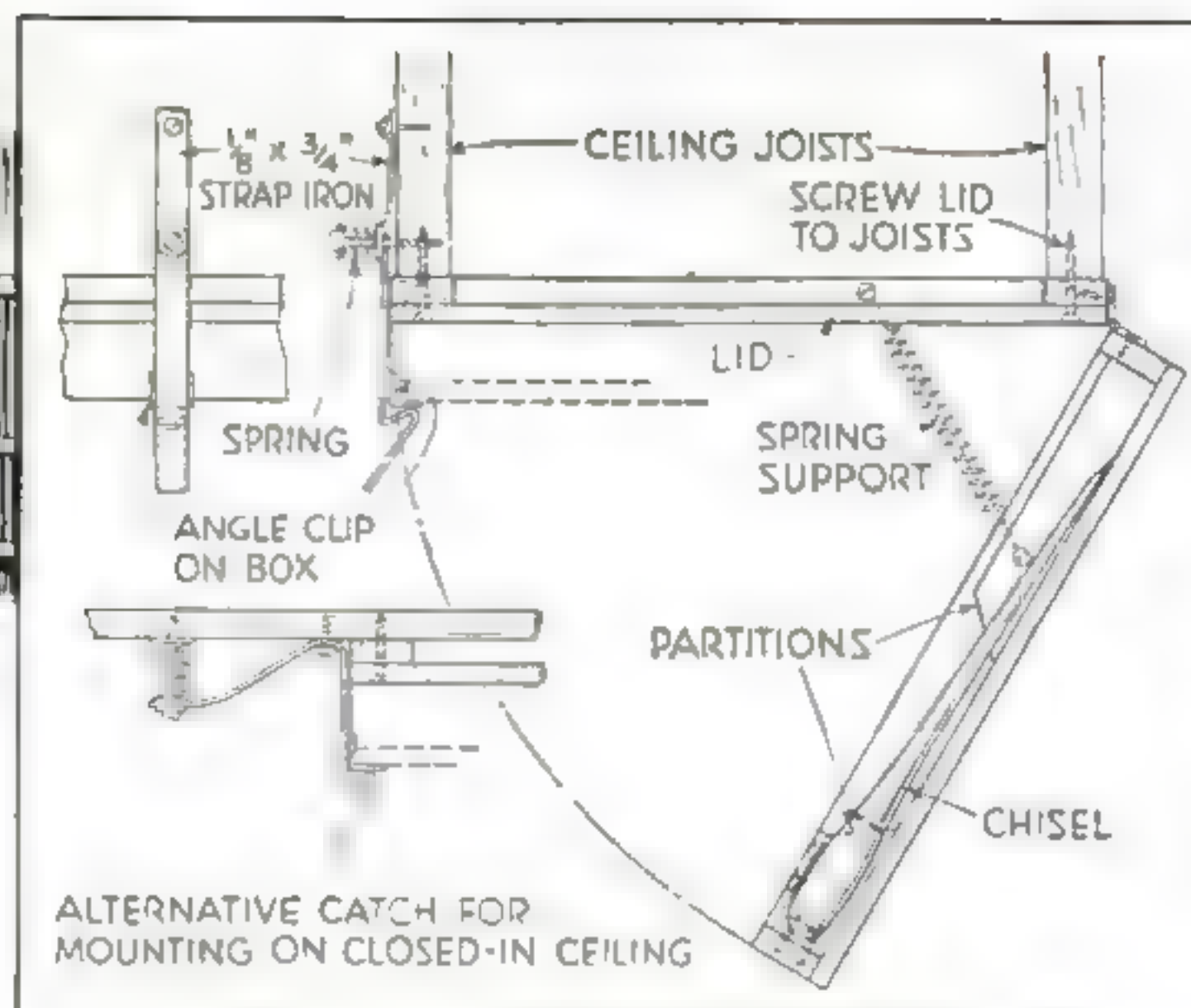
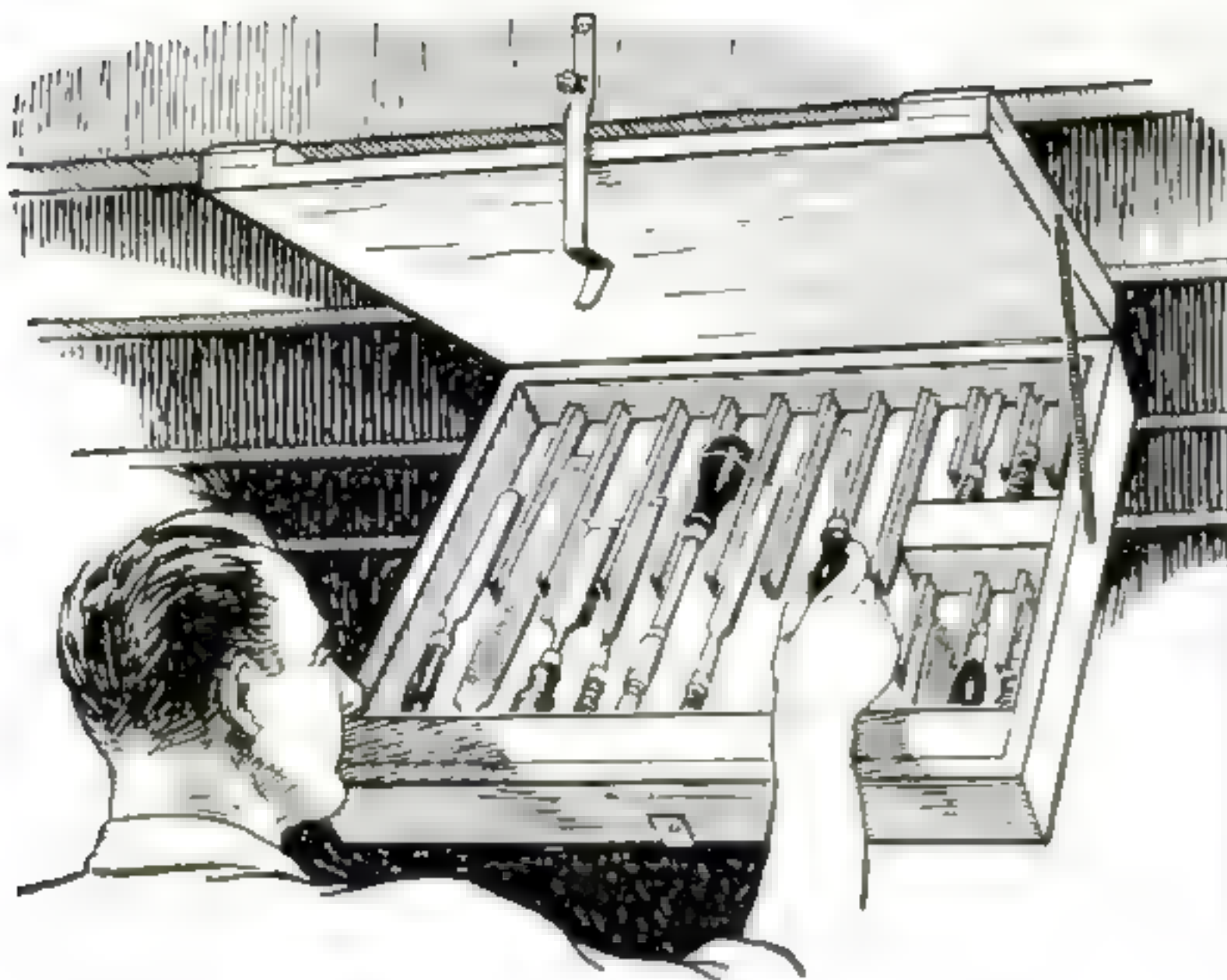
**C**ELLAR windows sometimes become badly warped and let in a lot of cold air because they are improperly fastened. Always use two catches or turn buttons near the bottom, one on each side. Also, in applying the hook and eye that holds the window open, center them, because if the hook is used at one side, the opposite side of the window sags and is likely to take a permanent set.



## Food-Grinder Support

TO PROVIDE a place to clamp a food grinder, Leslie R. Wilson, of Anaheim, Calif., uses a board  $1\frac{1}{4}$ " thick, 4" wide, and of a length to slide under the working top of the kitchen cabinet. It is slightly tapered so that it wedges solidly into its opening when drawn out.



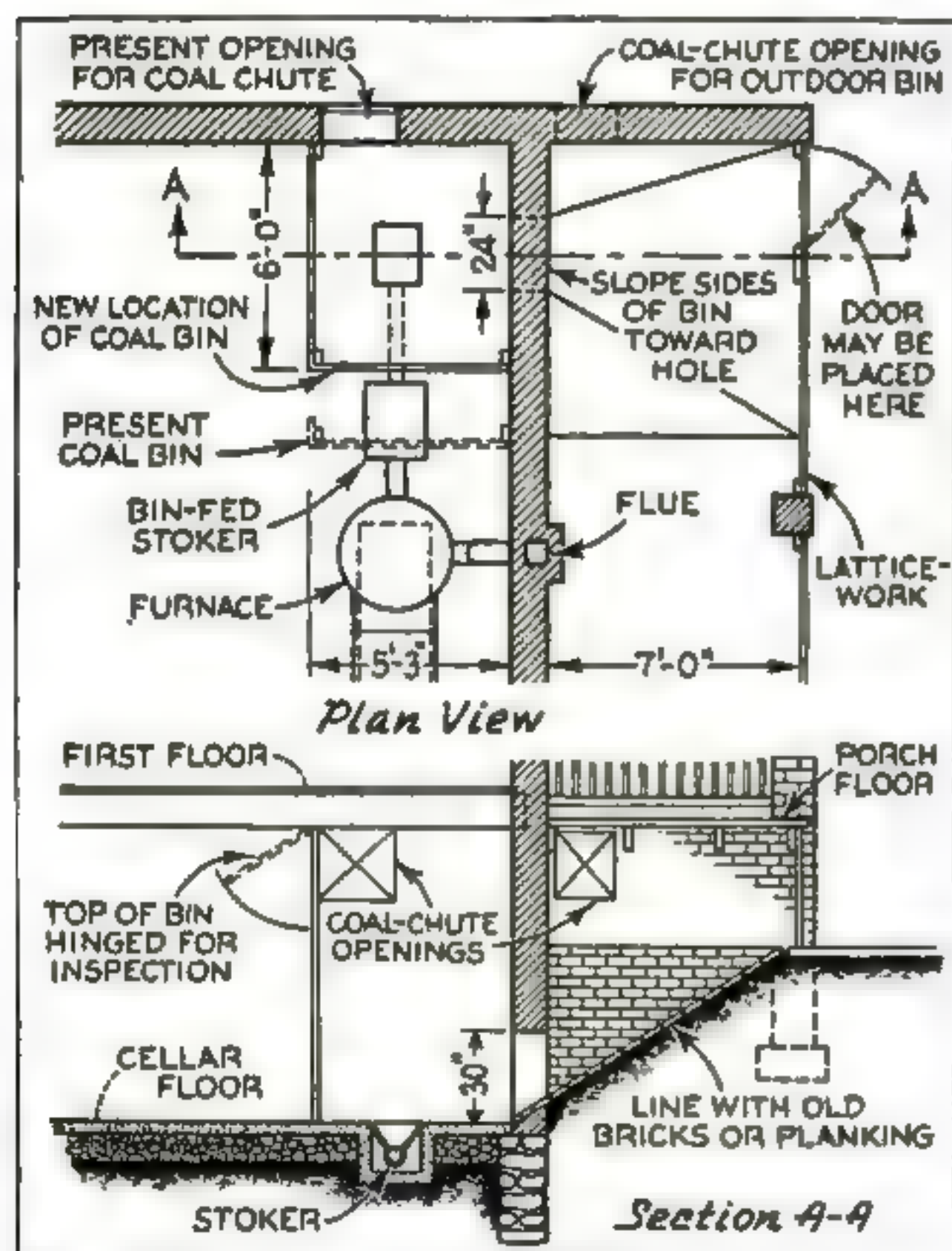


For basement workshops, cabinets of this type keep frequently used hand tools right at your finger tips

## Ceiling Cabinets Hold Hand and Lathe Tools

BUILT primarily to protect chisels and gouges from nicks and rust, this ceiling cabinet proved so convenient that a second one was built for various hand tools. The one for the chisels is about 18" by 34"; the second one,

18" by 22" by 2" deep inside. The degree of opening is controlled by a tension spring, adjusted so the case will come to rest at about 30 deg. from the vertical. This makes it unnecessary to clip the tools in place.—J.A.T.



## Sloping Coal-Bin Extension Built Beneath a Porch

WHEN a mechanical stoker is to be installed in a small basement and extra space is required for coal storage because the present bin must be cut, it is frequently possible to build an extra bin under the porch as shown.

Cut a hole about 24" by 30" through the basement wall, and line the hole with a stiff cement grout to reinforce the ragged edges and make a smooth passage for the coal. Scoop out the fill under the porch so the sides slope toward the hole. Smooth off and tamp solid, then line the slopes with planks or old bricks laid without mortar. Latticework around the porch footing can be replaced with closed panels, if necessary, to keep out the cold or to prevent freezing if the coal is exposed to moisture from a leaky porch floor.

An arrangement of this type enables me to purchase my full winter supply of coal at lowest summer prices.—HARRY L. BRUNNER.

## Solder and Paste Kept Together

A CAN of soldering paste and a small spool of wire solder can be kept together for convenient use by fastening them with about three drops of solder as shown at the right. This does not interfere with hanging the spool on a nail or peg, if desired, and both paste and solder can be used while in that position.—RUSS ALEXANDER.





By  
PAUL R.  
BUSSLER



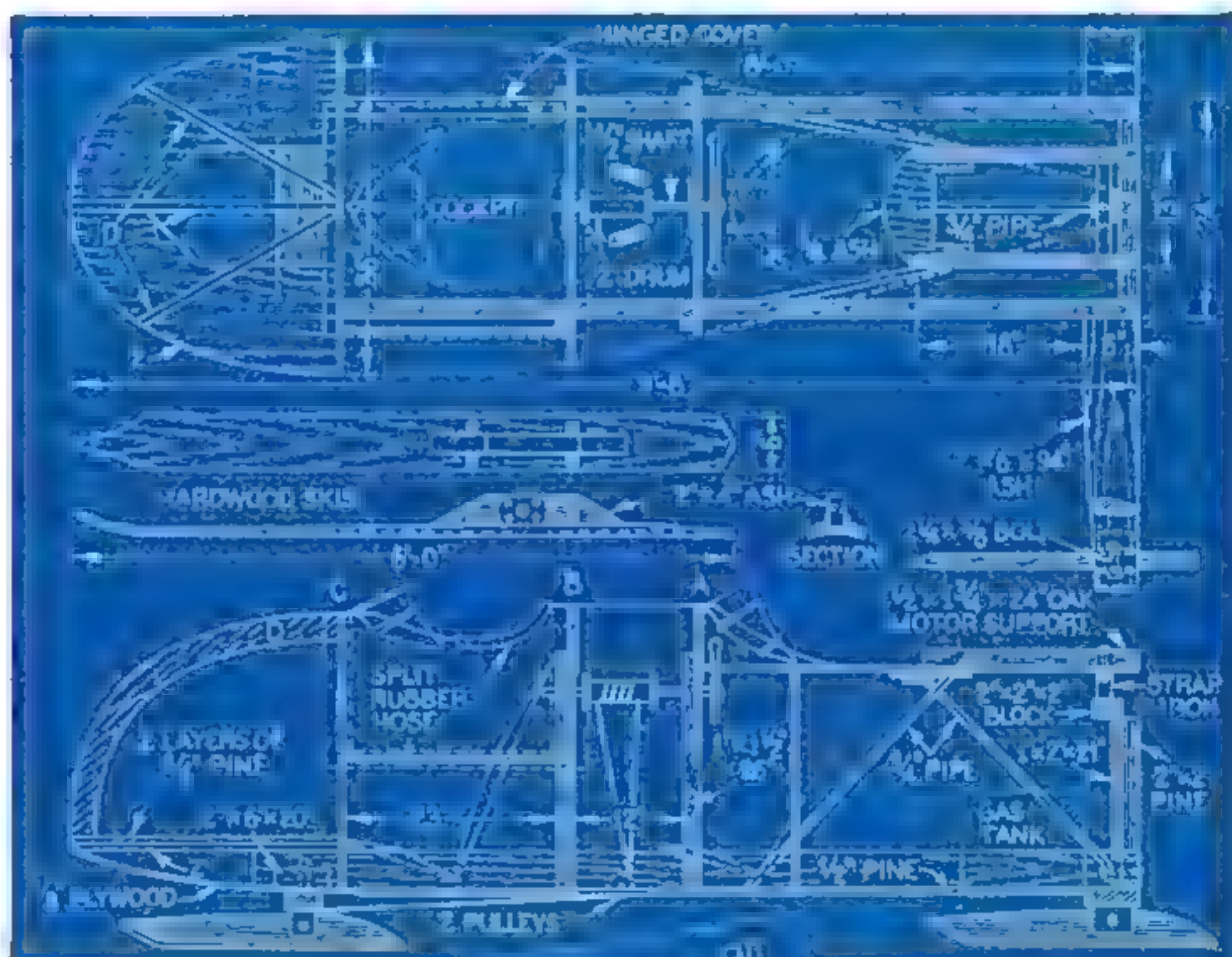
# Speedy Ice Sled

Skis are used on snow, but for ice the sled is fitted with steel runners

## DRIVEN BY MOTORCYCLE ENGINE

POWERED by a converted four-cylinder motorcycle engine, this streamline sled will speed across the ice on runners, or it can be equipped with skis to skim over the snow. It is of airplane-type construction and can be built for comparatively little. The overall length is 9' 8".

Choose straight-grained 2 by 4's for the chassis. Use ash for the front runner support and drill a hole to take the shank of the bicycle fork, which must be cut as shown. A cotter pin in the top of the shank keeps it from falling out. Draw full-size patterns of A, B, C, D, and Z. Frames A and B are the same except for the side fairing, which is made of  $\frac{1}{8}$ " plywood. Frames C and D are made in several pieces of  $\frac{1}{2}$ " pine spliced together and fastened with thin plywood



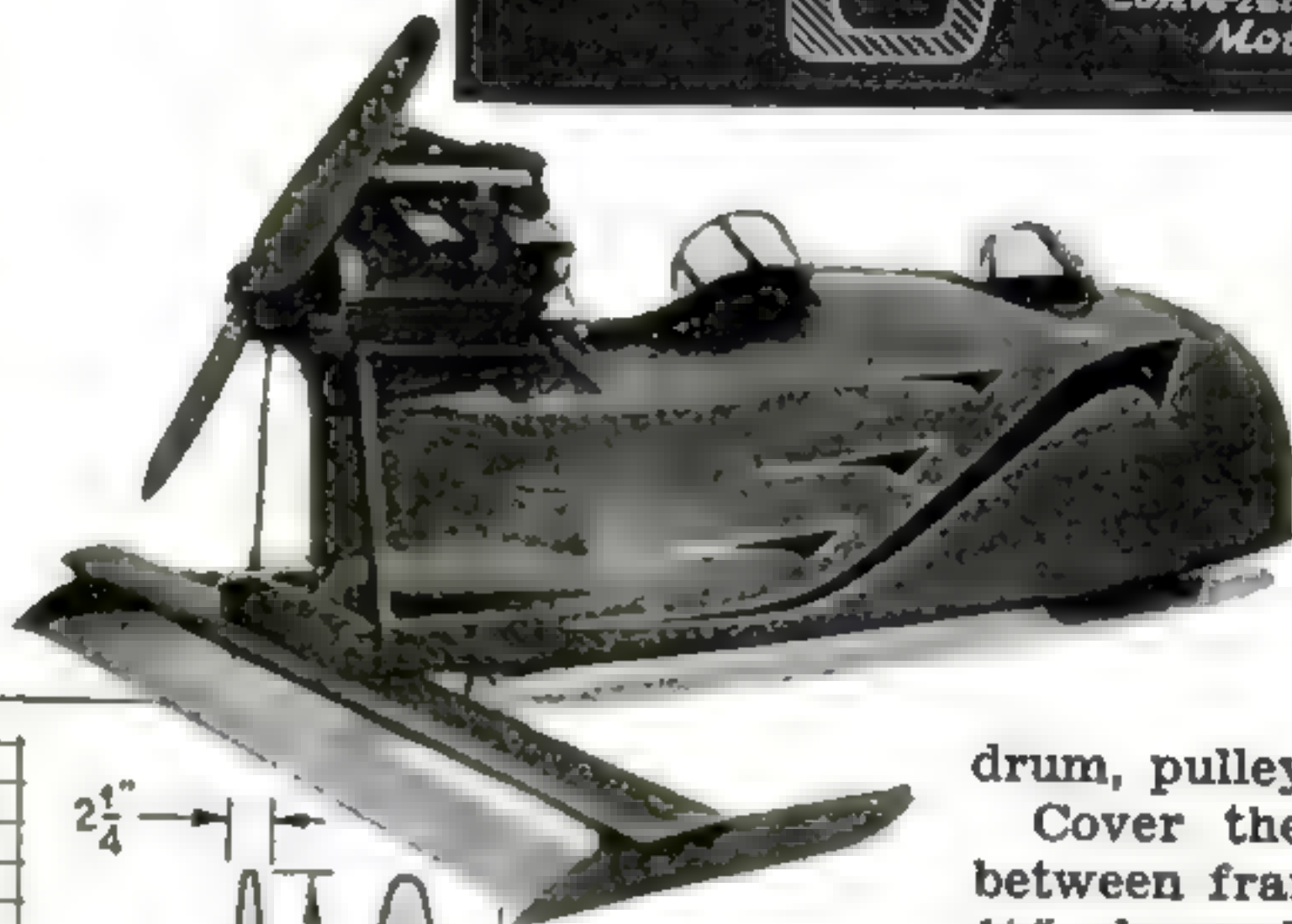
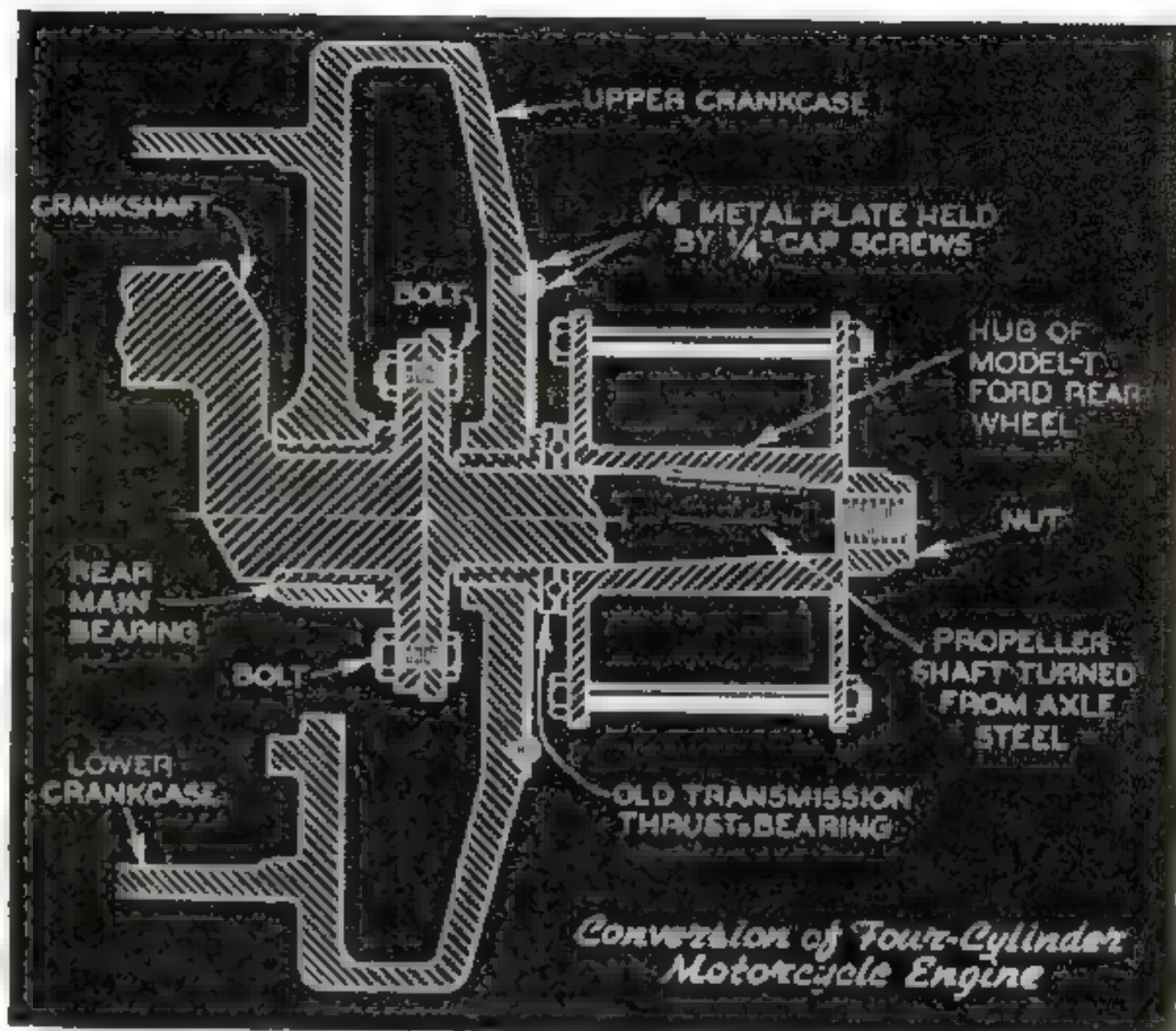
Top and side views showing the general method of assembly. Left, details of the front runner support



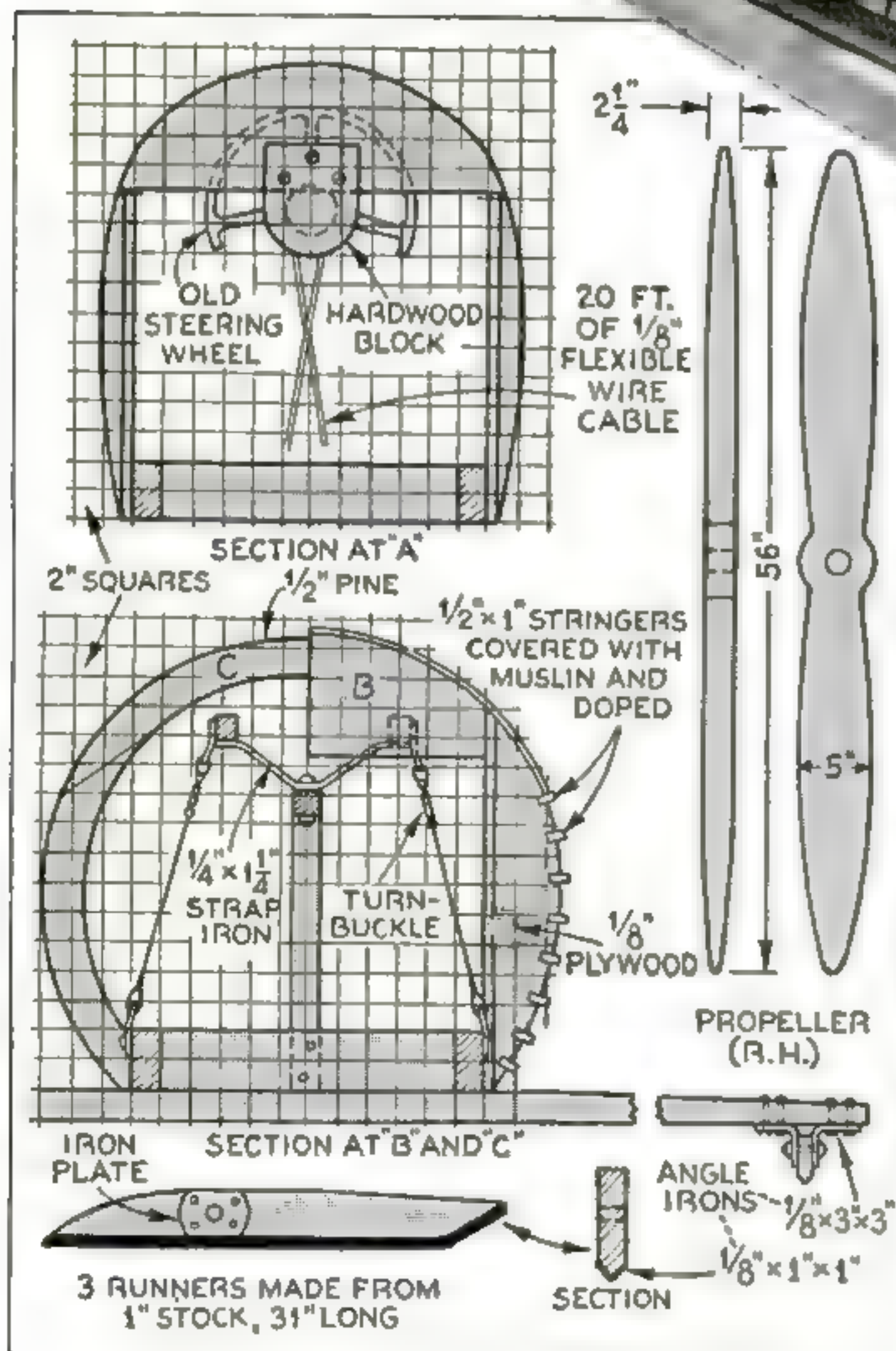
cleats. Part Z consists of two layers of  $\frac{3}{4}$ " pine. Frames D are attached to it and to C with screws.

Make the support for the two rear runners from ash planed to the shape indicated. The runners themselves are 1" by 4" by 31", sheathed with  $\frac{1}{8}$ " by 1" by 1" angle iron. Sharpen the angle to a knife edge so that it cuts the ice. For use on snow make three skis from hardwood 1" by 6" by 72" and sand the bottom concave as shown. To bend the ski tips, wrap them in burlap and stick in boiling water for thirty minutes; then place under a board nailed to cleats on the floor and bend upward to a 45-degree angle (see "The Expert's Way of Making Skis," P.S.M., Dec. '37, p. 78).

Fasten hardwood blocks  $\frac{1}{2}$ " thick to frames A and B after drilling holes large enough to take the  $\frac{1}{2}$ " steering shaft. Cut off the lower part of an old auto steering wheel and install the steering rod,



The transmission is cut from engine and its thrust bearing used for propeller. Left, sled with runners for ice. Note front cockpit for carrying a passenger



How the three bulkheads are made; side and front views of propeller; method of making the runners

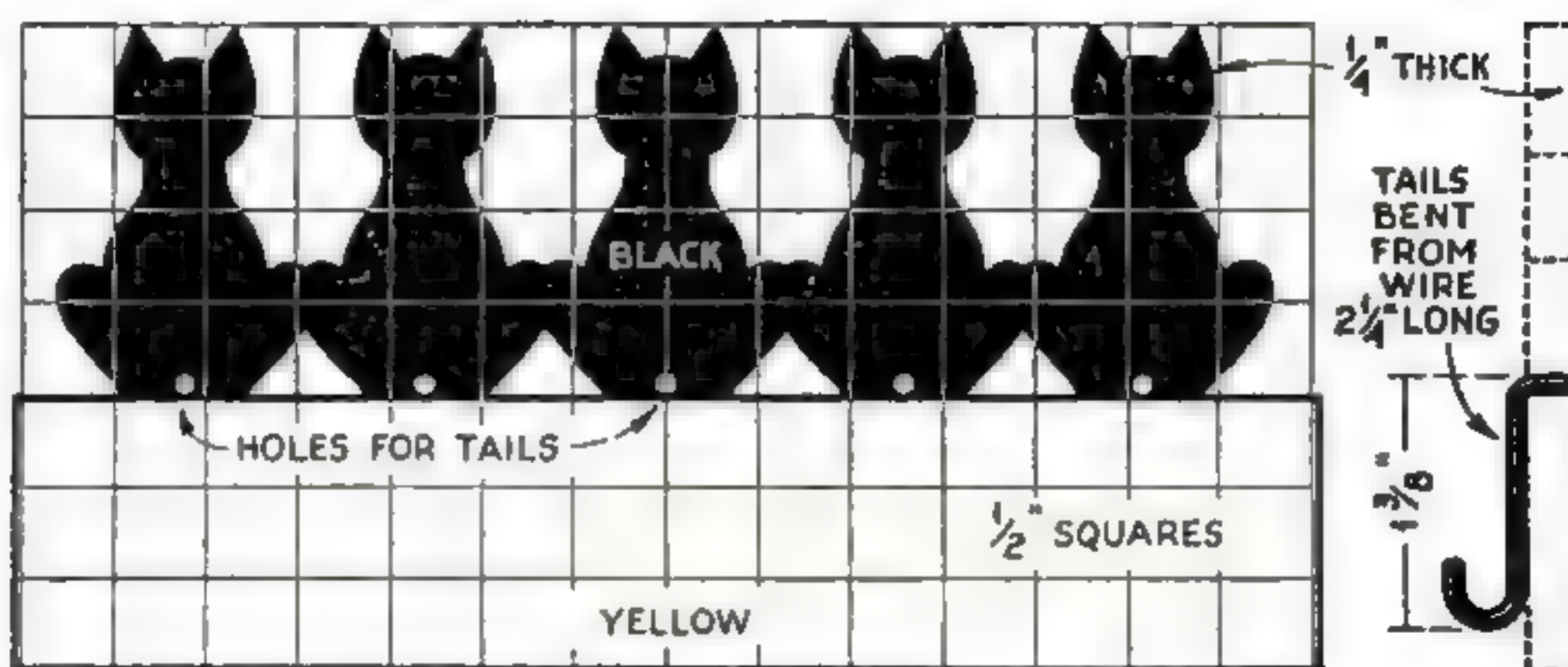
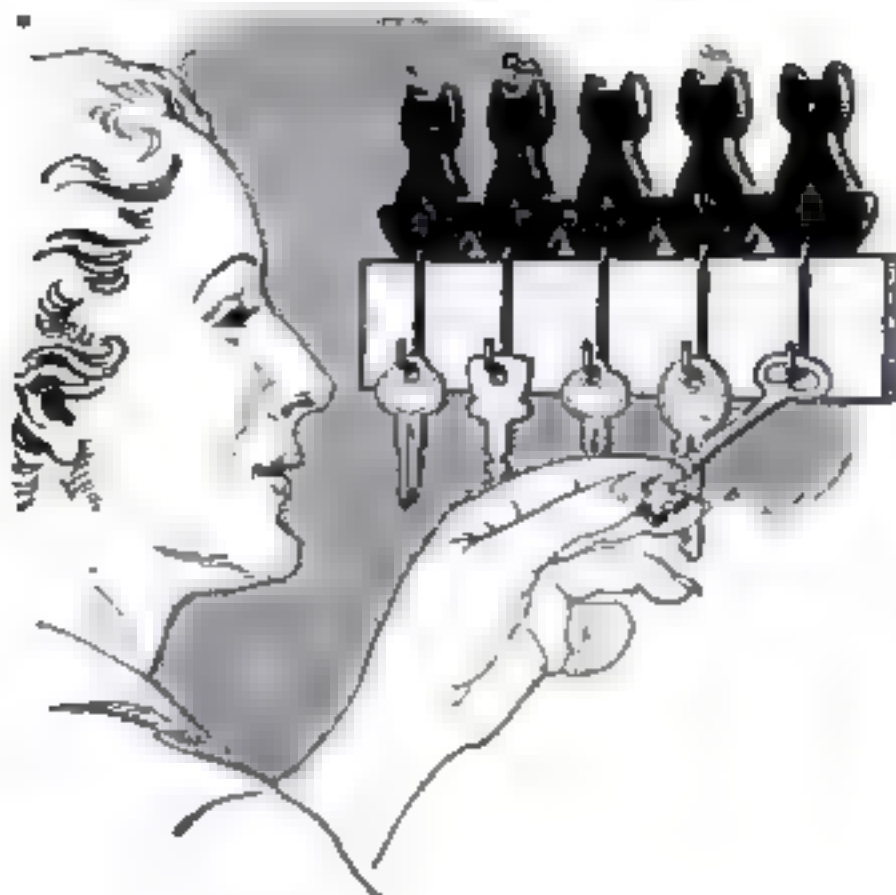
drum, pulleys, and wire cable.

Cover the top of the sled between frames A and B with  $\frac{1}{8}$ " plywood. Make the framework of the hinged cockpit covering of  $\frac{1}{2}$ " white pine and cover with plywood also. Cut notches into the fairing for the  $\frac{1}{2}$ " by 1" stringers along the side and use bamboo stringers around the nose. Cover with muslin and give it three coats of airplane dope. Finish with two coats of paint. The two celluloid windshields are held in place with metal brackets.

To convert a four-cylinder motorcycle engine into a suitable power plant for the sled may require some ingenuity, but the fundamentals given in the sketches apply to most types. On the original sled, the propeller hub was turned from the hub of a model-T Ford rear wheel, and the propeller shaft from axle steel. The latter has the same taper as a model-T Ford rear axle. The thrust bearing is the same one that was in the transmission. Cut the transmission off the back of the flywheel housing, remove the flywheel, and then bolt the propeller shaft to the crankshaft flange. A pressure system is used to force gasoline up to the engine.

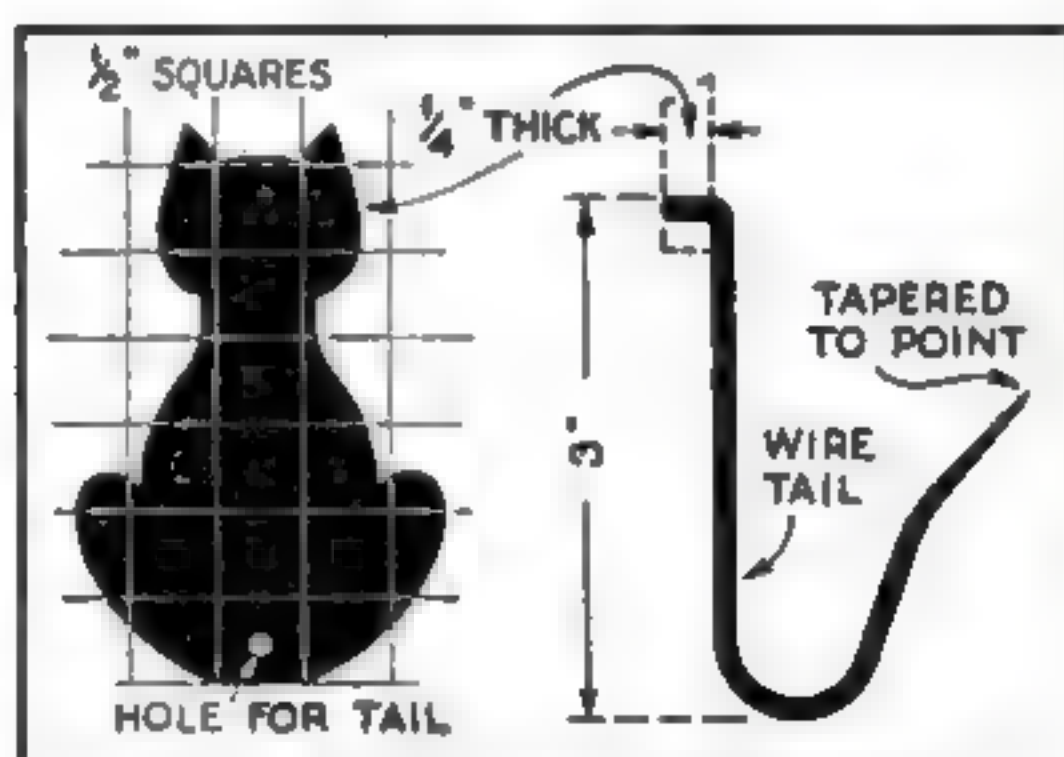
You can purchase a propeller or make one from birch and walnut, or from solid ash. The author's sled does not have a propeller guard, but one should be added if the sled is used where there are many persons around.





## Comical Cat-Tail Novelties Made from Scraps of Wood and Wire

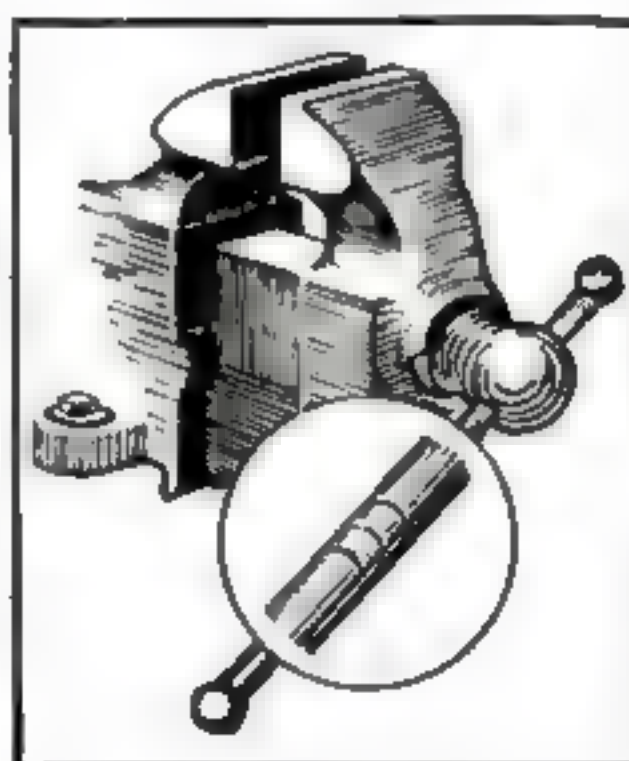
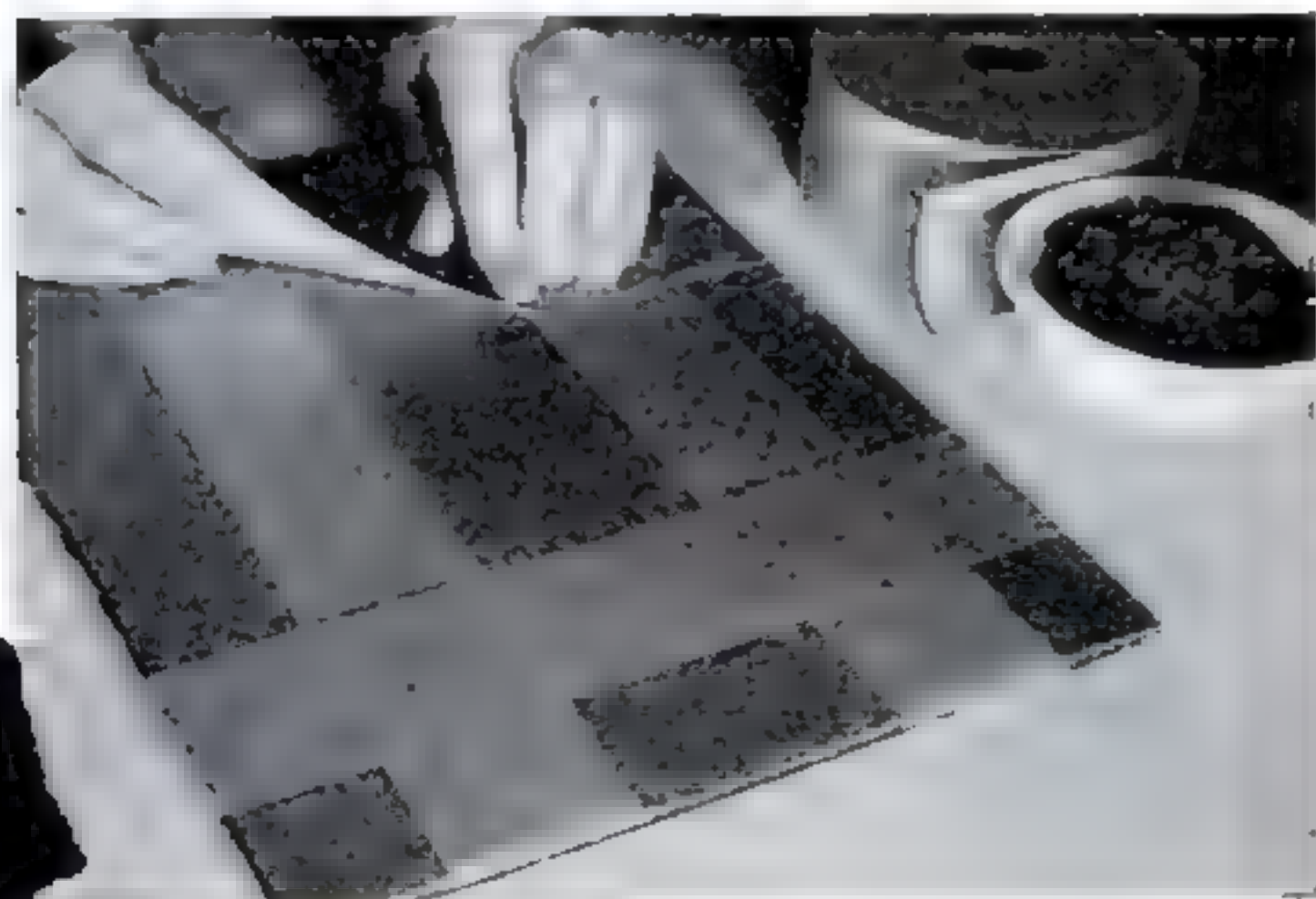
THESE cat-tail novelties—a key rack or hanger for pot holders and a wall spindle—are made from scraps of wood and a discarded wire clothes hanger. The cats are jig-sawed, drilled for the tails, and finished with a coat of flat paint or enamel undercoat followed by two coats of enamel. The tails are bent from pieces of wire, and the one used in the paper spindle is filed to a smooth point. It is advisable to guard this point with a cork. The five short tails are each  $2\frac{1}{4}$ " long and



the tail for the spindle is a 6" piece of wire. Paint them black before gluing the ends in the holes.—CARL L. SORESENSEN.

## Reducing Cost of Mailing Photos and Drawings

IN MAILING photographs, drawings, or other flat material, the weight can be reduced and postage saved by using a single piece of corrugated cardboard instead of the customary two pieces. To make one piece serve this purpose, it may be reinforced by sticking on wide strips of gummed paper. If two strips are used in each direction, as shown, the single board will be stiff enough to give ample protection.—JAMES F. SCHINDLER.



## How to Free a Sticking Vise Handle

THE handle of a machinist's vise is intended to slide freely through the ball knob on the end of the vise screw, but in time it

is likely to stick because of the accumulation of grease and dirt. To remove this, cut two or three notches in the handle with a sharp chisel; these should be no deeper than the teeth of a fine hack-saw blade. A few strokes of the handle through the ball knob will remove all the hard-packed dirt, and the notches may then be filed off.—DAN MARVOSH.

## Use for Blackboard Erasers

FOR sanding flat surfaces by hand, an ordinary blackboard eraser forms an excellent sandpaper block. I am able to find plenty of discarded school erasers to use for this purpose, but new ones are still better.—L. C. T.



# Cutting Dovetail Joints on

By **HOWARD R. HEYDORF**

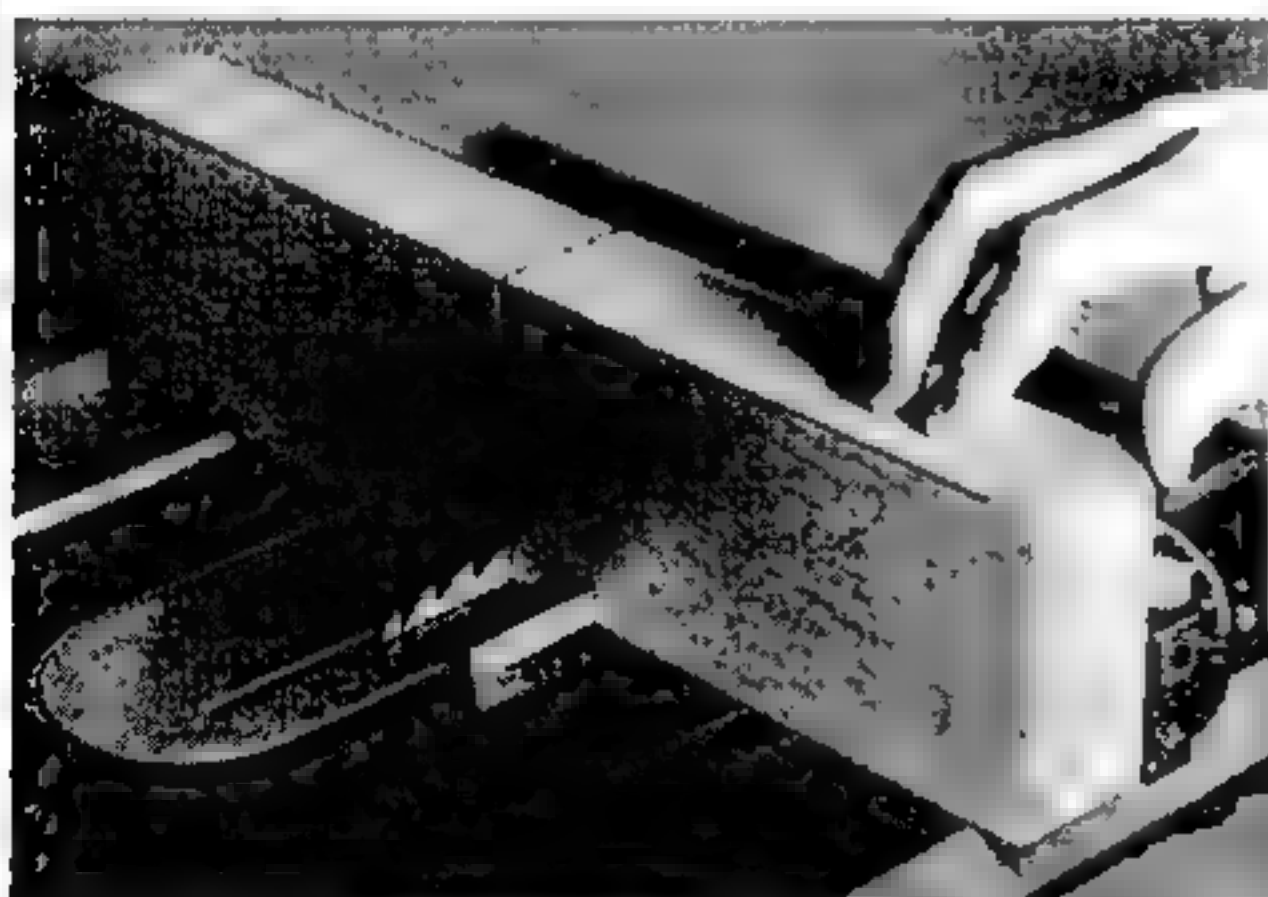
**D**IFFICULTIES involved in making dovetail joints by hand tend to prevent the average home craftsman from attempting them. This is to be regretted because they are among the best corner joints—attractive in appearance and very strong and rigid. It is possible, however, to make these joints on a circular saw possessing only the regular adjustments.

The wood must be of uniform width and thickness. It is best to rip all the stock at one time to a width slightly greater than necessary. The edges should not be planed till after the joints have been cut. A drawing of the sockets for one joint should be made and transferred to the wood, special care being used to space the sockets equally at the ends.

To insure that all of the saw cuts are the same distance apart, an indexing jig is used on the miter gauge. First, prepare a piece of wood 2" thick, about 5" wide, and as long as the saw table is wide. Make a saw cut about  $\frac{1}{2}$ " deep in one edge; then move the block over and make a second cut so the distance

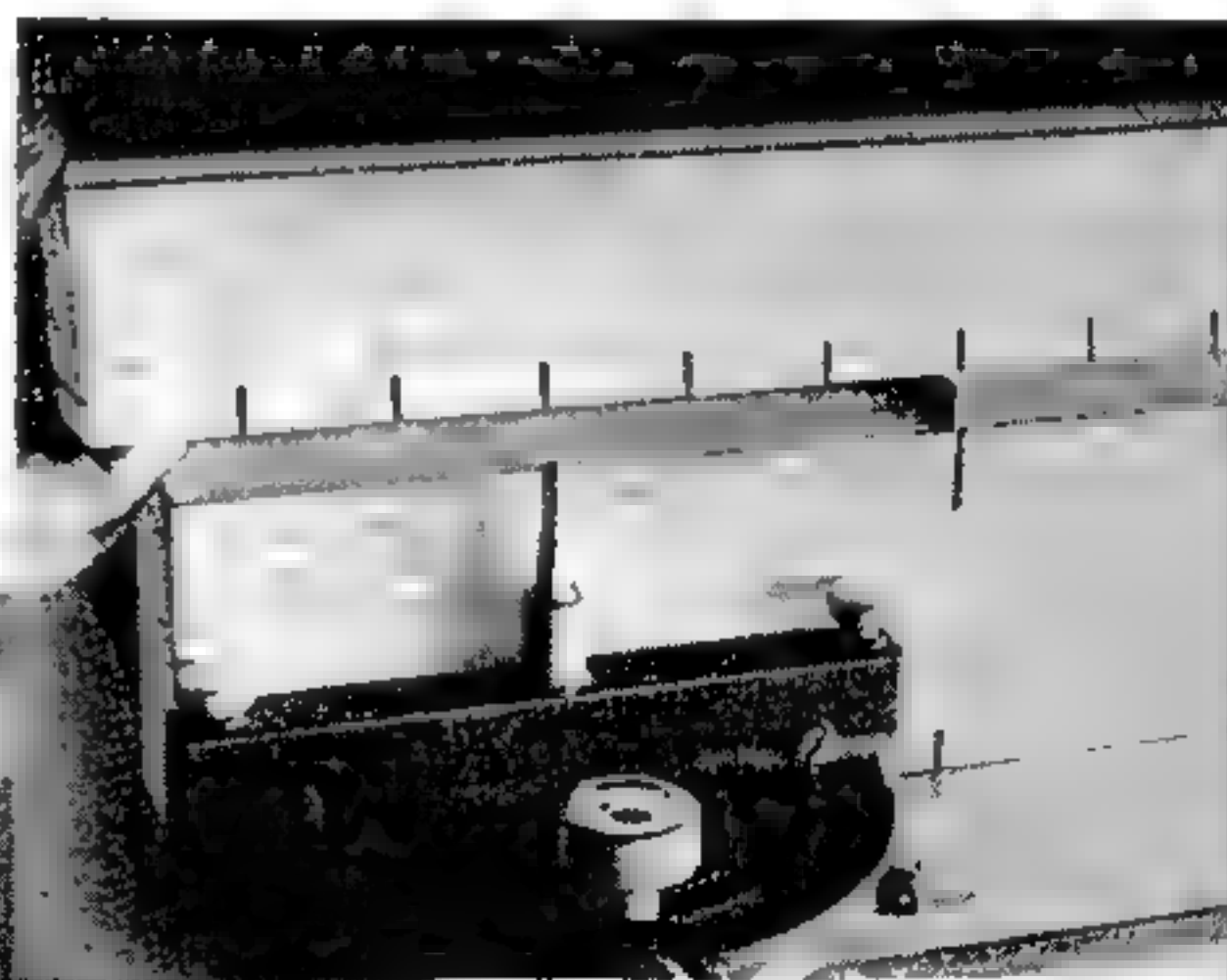
between the two cuts from center to center is equal to the distance  $D$ . A third cut is made in the opposite edge directly above the second cut. The block is screwed to the miter gauge in the position in which the second cut was made, and a small strip of wood is fitted into the first cut as shown. The projecting part is sanded slightly thinner.

The index strip is made from a piece of wood of the same length and thickness as the first and about 3" wide. This is clamped to the front of the first block, and a cut made in its edge near one end. This cut is placed over the projecting strip in the first block, and a second cut is made. The second cut is then slipped over the strip, and the third cut is made. This is repeated until the strip is notched at equal intervals for its entire length. The strip in the front of the first block is now removed. A thin strip of wood with the grain running up and down is glued into the top notch in the first block. It should project about  $\frac{1}{2}$ ". This projecting end should be sanded slightly thinner. The index strip is placed upon the first block with one of the cuts fitting over the projecting strip. This index strip can then be raised and moved



The first block with the three saw cuts and the locating strip, which is employed temporarily for cutting the index strip

The index strip is cut at equal intervals by placing each notch in turn over the projecting piece of the first block



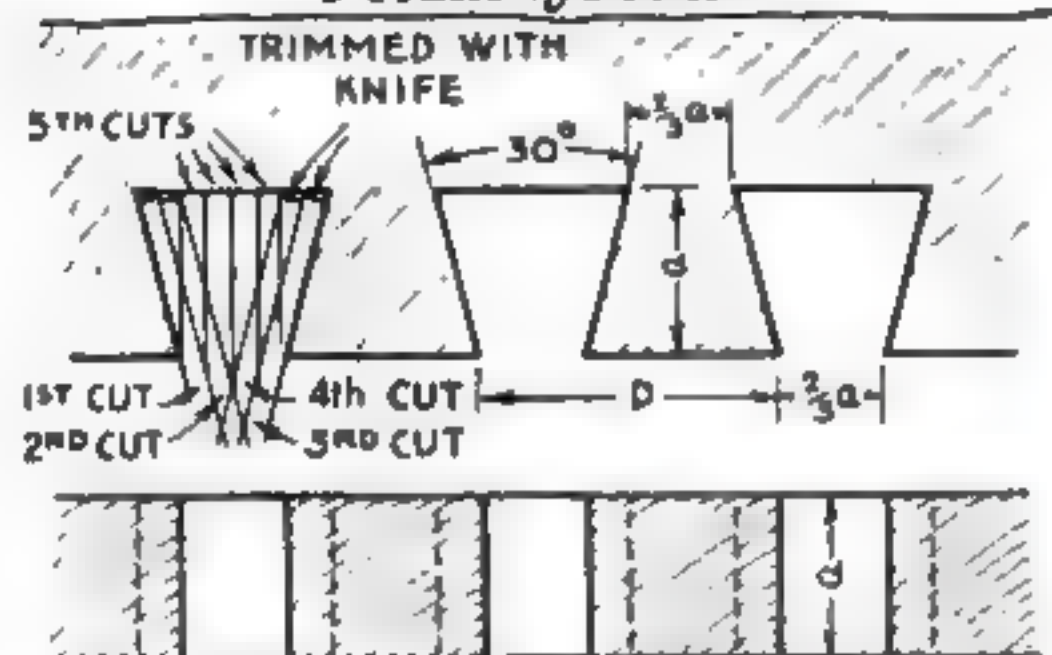
The index strip is raised and moved over one notch at a time to gauge the saw cuts for the joint. Note the small locating strip. The work is clamped to index strip as shown at right, on the facing page



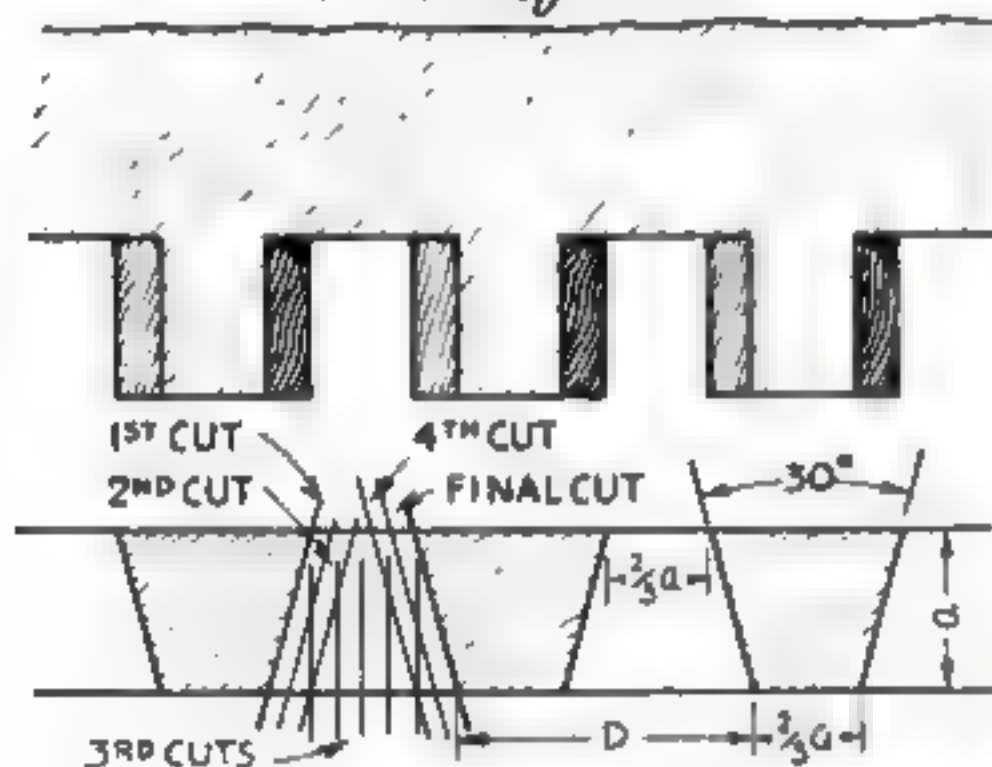
# a Circular Saw

To remove the center waste, return the saw table to level and use the saw blade, not a dado head. Finish corners with knife or file

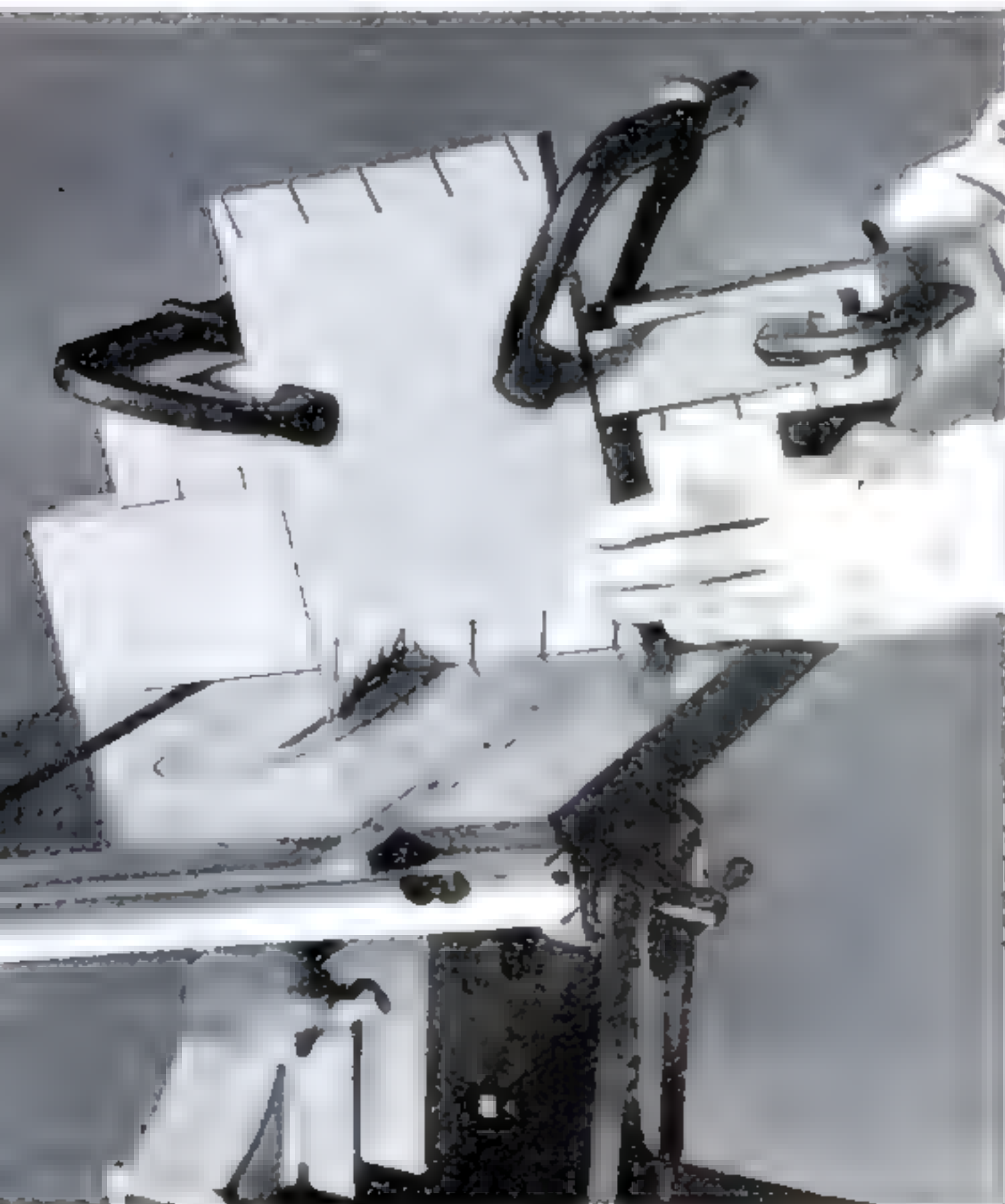
*Details of Sockets*



*Details of Pins*



Dimension  $a$  is equal to thickness of wood, and  $D$  is equal to the distance between any two corresponding parts



Left, cutting the first side of the sockets. The bed of the saw is tilted at a 15-deg. angle. A small stop strip is clamped to the index strip to locate the position of the first cut. Below, the wood is reversed to cut other side of sockets

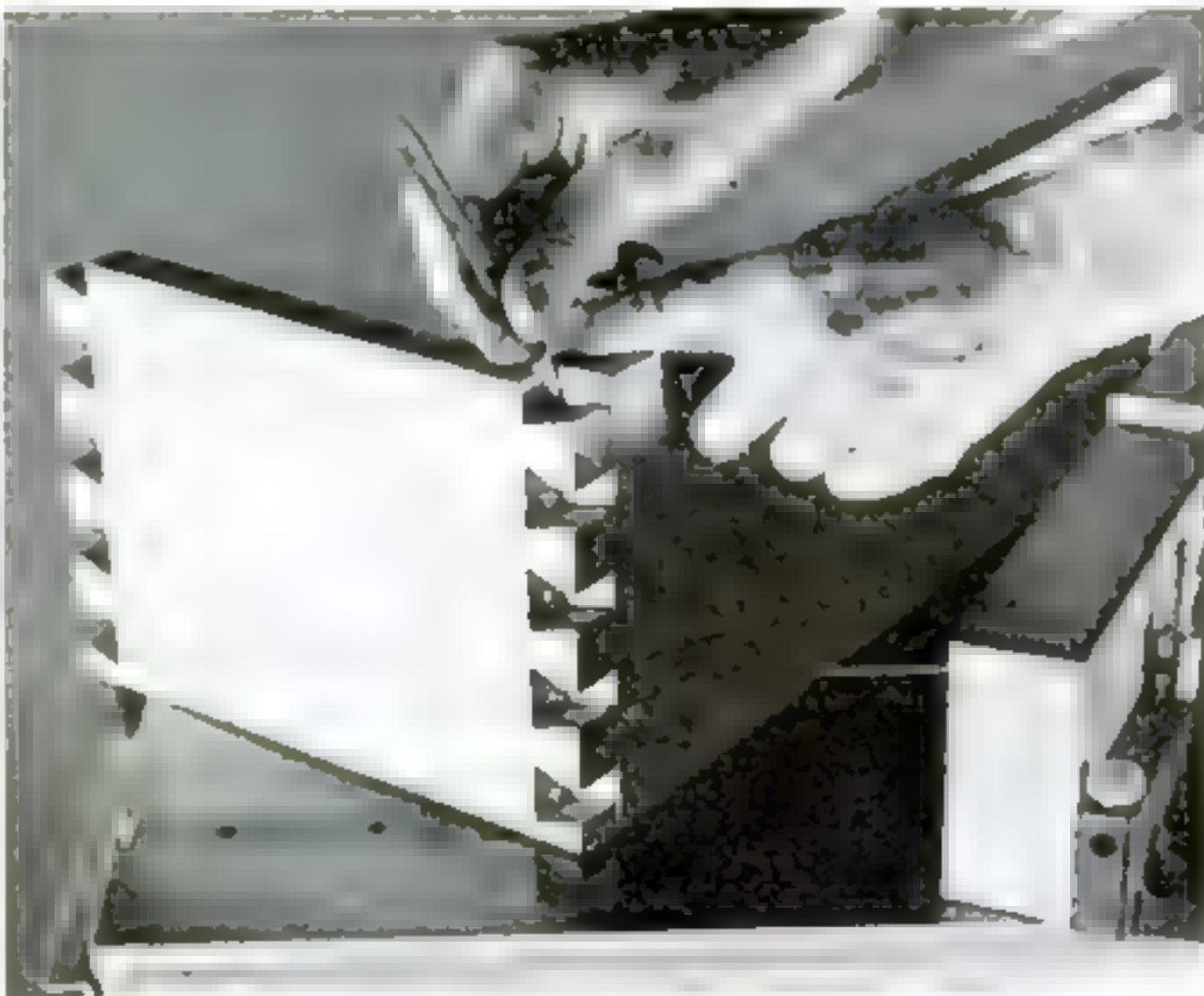




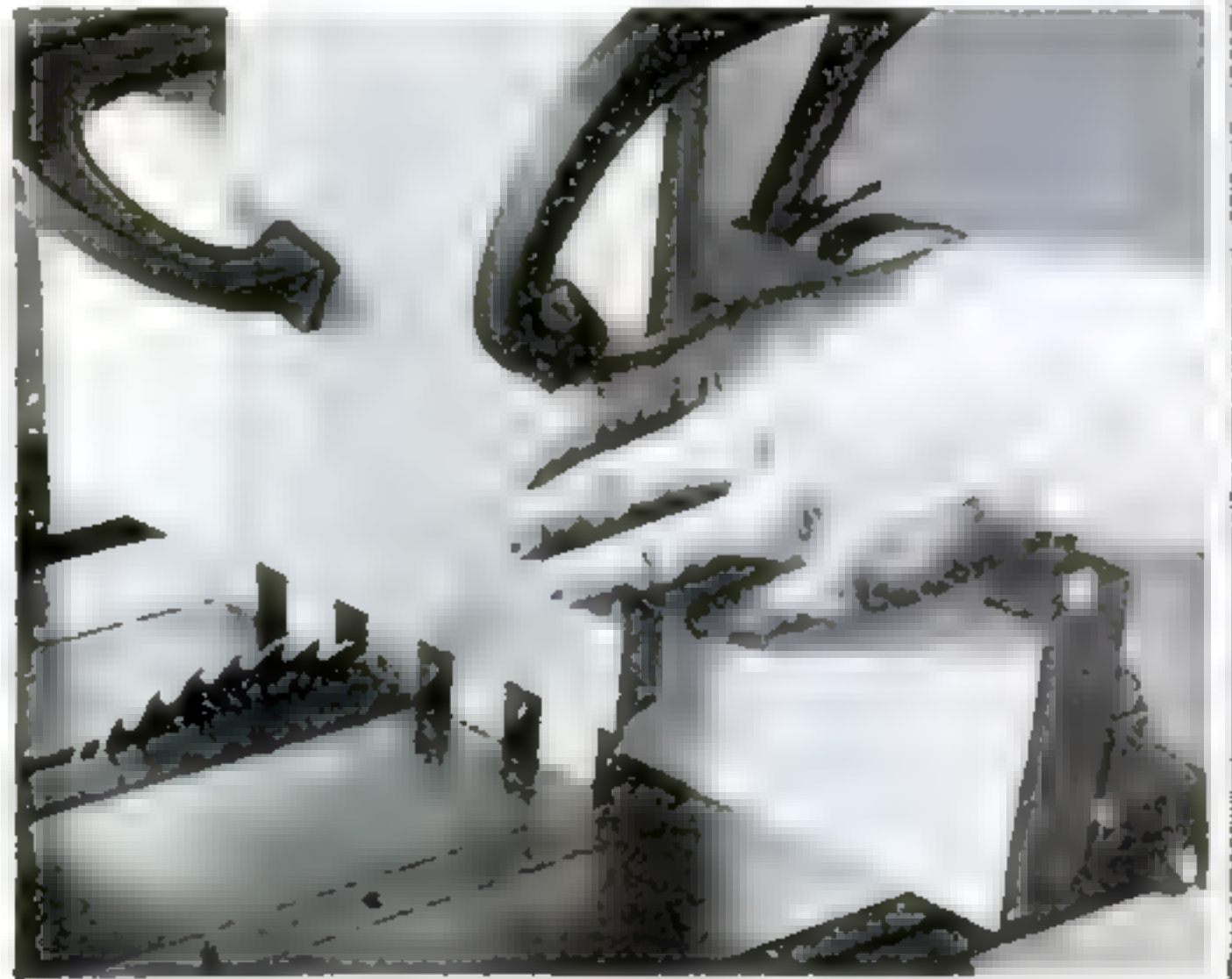
over one notch at a time to gauge the saw cuts for the joint.

The bed of the saw is tilted at a 15-deg. angle. The material is clamped to the index strip as shown and the sockets are cut first. This should be done in such a position that the saw blade just shaves the line in the inside of the first socket. The cuts for the other sockets are made by moving the material and the index strip over one notch at a time. The other end of the material is then cut. A small stop strip clamped to the index strip will quickly locate the position of the first cut. The stop strip is next moved over the thickness of the saw blade and another cut is made on the inside of the sockets, as shown in the drawings. The material is reversed and the other side of the socket cut in a like manner. Next the material is removed from the center of the socket as shown. It is not advisable to use a dado head because of the tendency to chip the edges. The corners of the sockets should be finished with a sharp knife or a file.

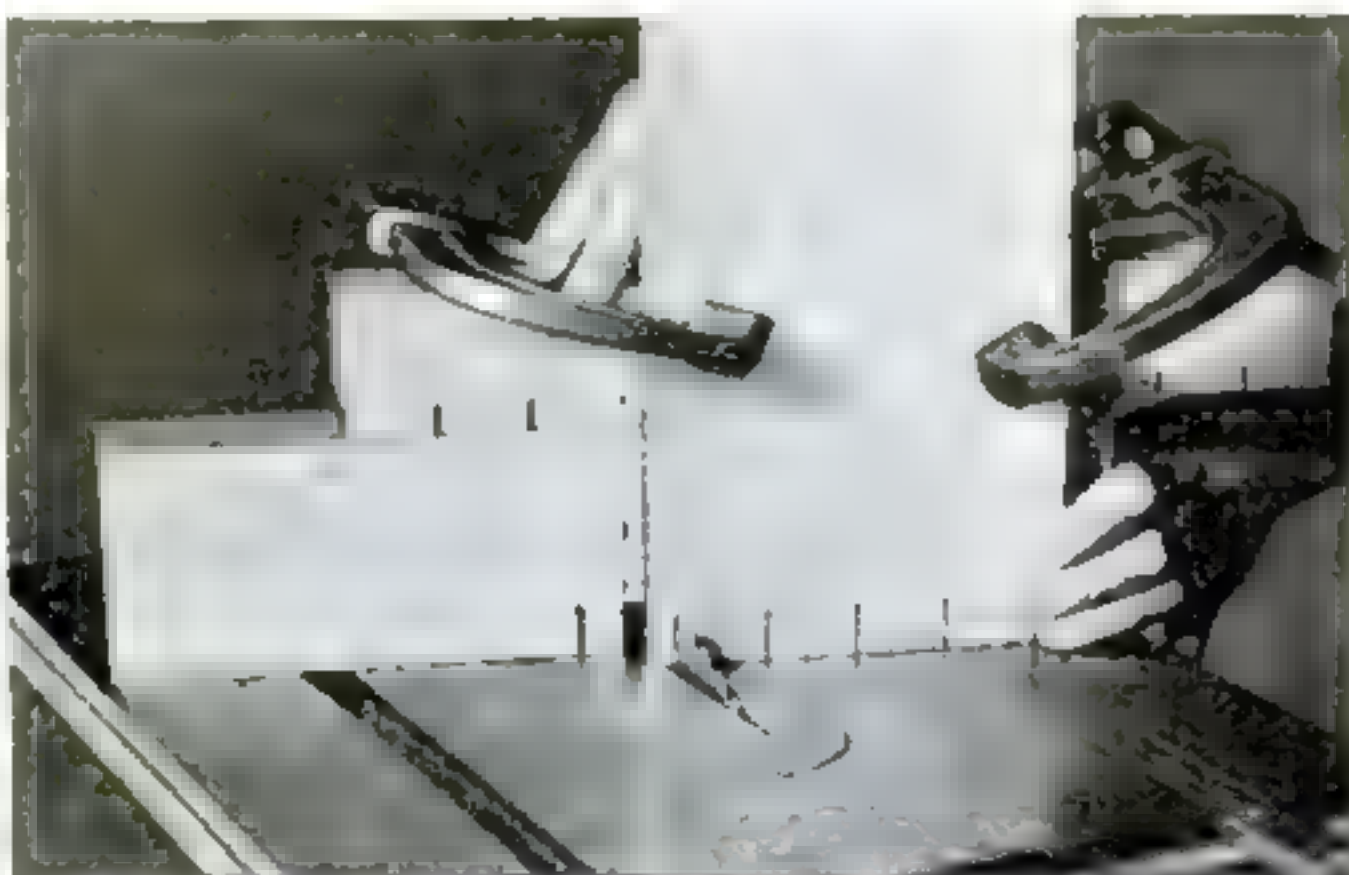
After the sockets are cut, the position of the pins should be marked from the sockets. The sections that are to be removed should be blackened to prevent any mistake. When more than one joint is to be made, it is best to cut them and finish them one at a time, although this applies only to the pins. The miter gauge is turned to a 15-deg. angle and the material clamped to the index strip. The first sides of the pins are cut and another cut made on the inside of this. This is similar to the sockets and is shown in the drawings. The miter gauge is returned to the square position, and the center material is removed in the same manner as the sockets. Next, the miter gauge is turned to a 15-deg. angle in the opposite direction, and the other side of the pins are cut. It is best to make the inside cut first, gradually working towards the pin. The material is shifted slightly after each cut. These slight cuts are made on all of the pins by using the index strip. When the pins will slip into the sockets with a snug fit, the joint is completed.



The location of the pins is marked from the sockets. To avoid mistake, blacken with a pencil the waste parts of wood to be removed



Cutting the other side of the pins. The material is removed gradually from this side until the pins slip into the sockets with a snug fit



The miter gauge is turned to a 15-deg. angle and the stock clamped to the index strip so that the first side of the pins may be sawed



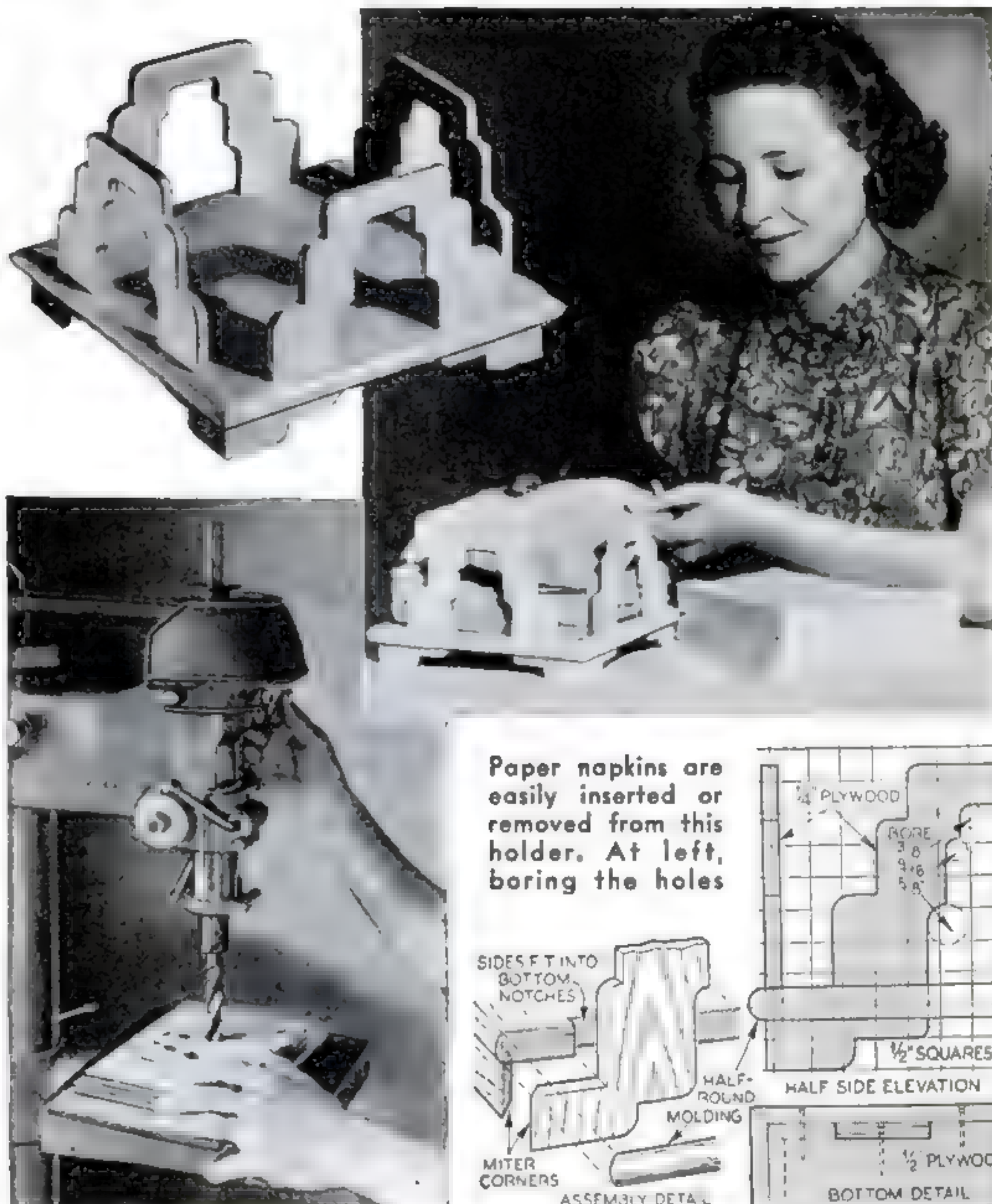
Completed dovetail joint. All pieces are the same thicknesses, but by making a suitable layout it is possible to use different thicknesses



# Handy Table Holder for Paper Napkins

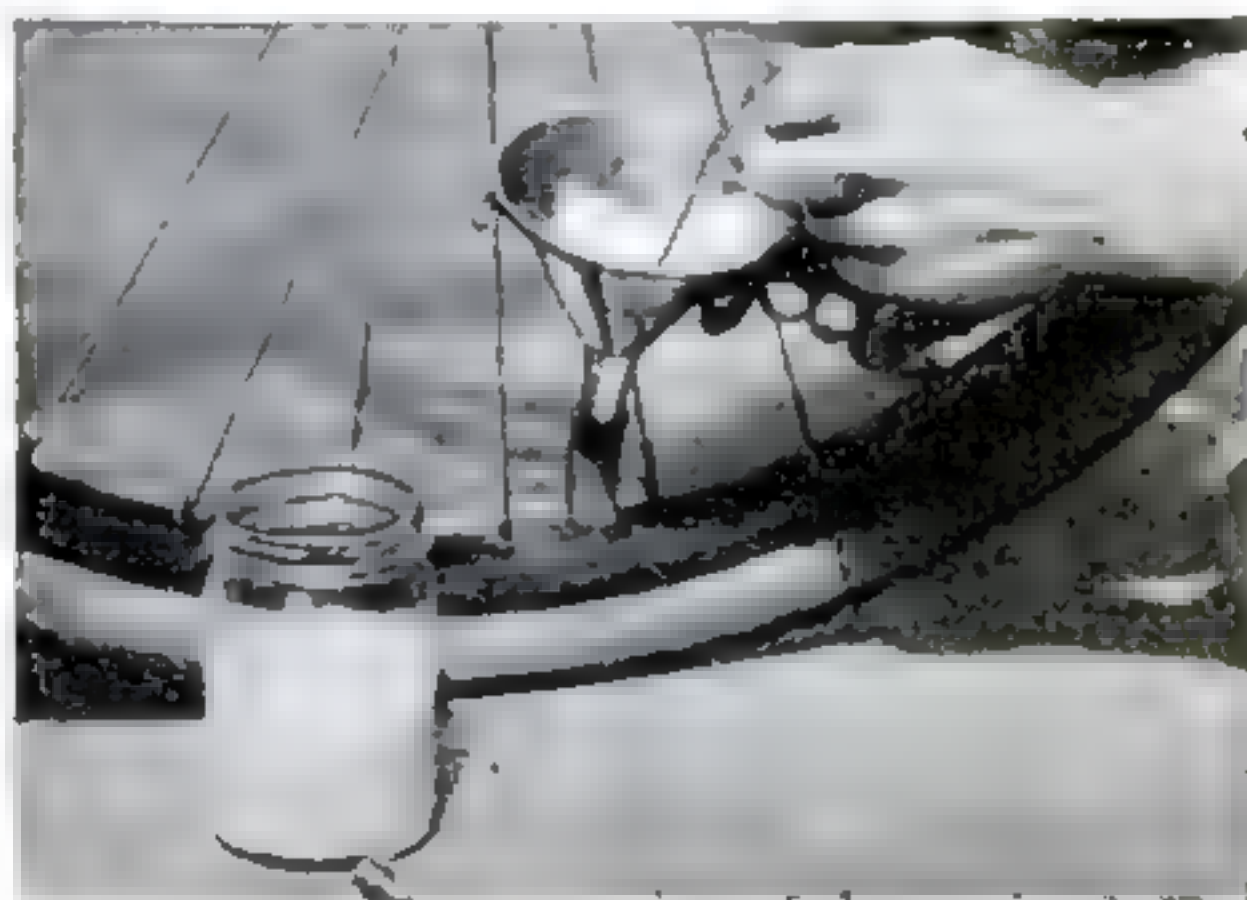
THERE'S no denying that paper napkins are growing in popularity, and a handy, neat-looking dispenser for table use is something that any housewife will appreciate. To make a container like the one illustrated, four plywood blanks for the sides are nailed together, bored for the inside curves, cut out on jig or band saw, and smoothed by using a file in the jig saw before the stack is taken apart. Sand the sides, miter the lower corners, and make a bottom notched to receive the sides. Nail the parts together. A piece of half-round molding, ripped from a hardwood dowel stick, is mitered around the assembly.

Either one- or two-color effects are suitable for this piece. Ivory, with blue tones brushed into the tops of the edge steps and the molding while the body color is still wet, is an attractive finish.



## Nonslip Dressing for Belts

WHEN small round leather belts on power tools have a tendency to slip under load, the following belt dressing will remedy the condition: In a discarded shoe-blackening tin, melt approximately three parts by volume of ordinary rosin, two parts of mutton tallow, and one of castor oil. Stir with a stick until a complete admixture is obtained. The compound, when cool, is smeared on the belt. If the mixture is too stiff, due to too much rosin, increase the amounts of tallow or castor oil until the desired consistency is obtained.



## Sealing Bicycle-Tire Leaks

VERY small leaks in ordinary bicycle tires may be sealed, in the absence of a commercial nonleak mixture, by making a thin paste of oatmeal, flaxseed meal, or bran with half water and half denatured alcohol. Insert this as shown above after removing the valve core.





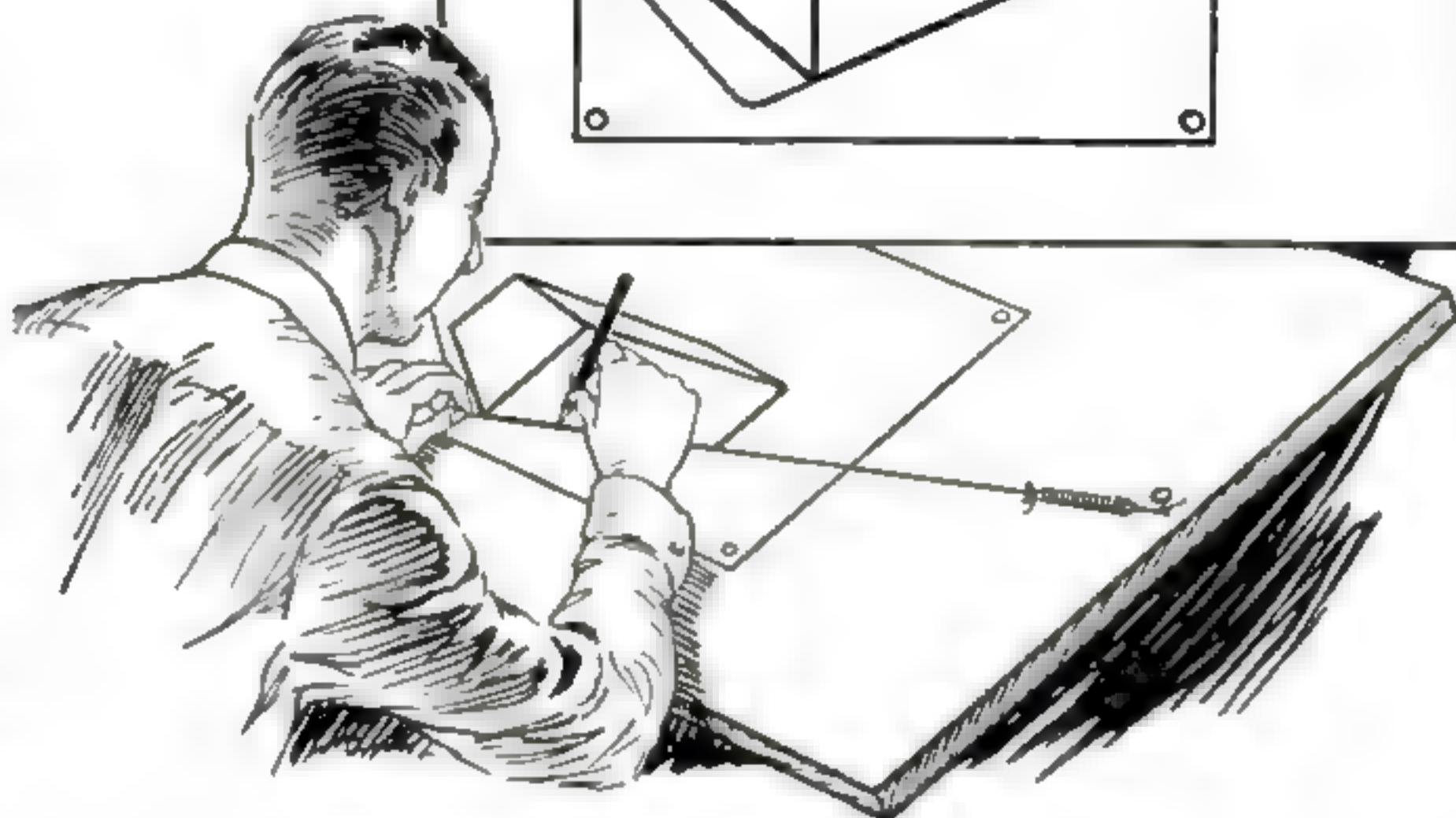
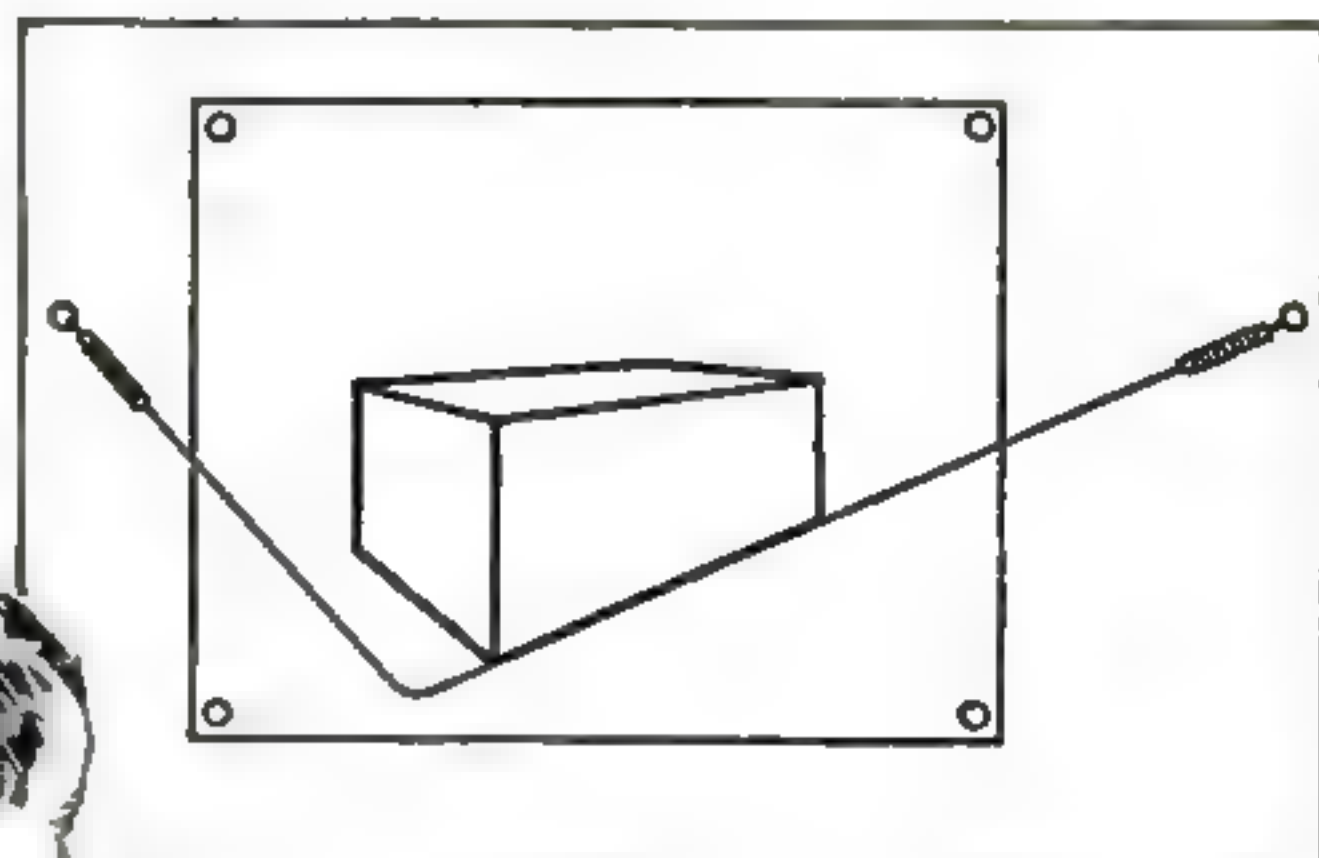
## Pump Spout Grooved to Hold a Pail

WATER pails can be more conveniently filled at a common hand pump of the type illustrated if two grooves are filed in the spout or trough in which to place the wire bail. No space is then needed for setting up a stand on which to rest the pail. File the grooves near the open end.—G. W. BATTEN.

## Spring-Operated Vanishing Line for Perspective Drawings

SIMPLE perspective drawings may be laid out quickly on either drawing board or blackboard by attaching a thin string or wire to the two vanishing points on the so-called "horizon line" by means of two small coil springs as shown below. This "vanishing line" may then be drawn up or down. Strong linen thread or a steel violin E-string may be used for the line, and two coil springs of good quality  $\frac{1}{8}$ " or  $\frac{3}{16}$ " in diameter and from 1" to 2" long will provide the necessary tension. For blackboard use, larger springs and stronger cord or wire are required.—FRANKLIN H. THOMPSON.

The direction of all vanishing lines is found by using a thread or wire held with springs



## NAIL SIZES

[HARDWARE]

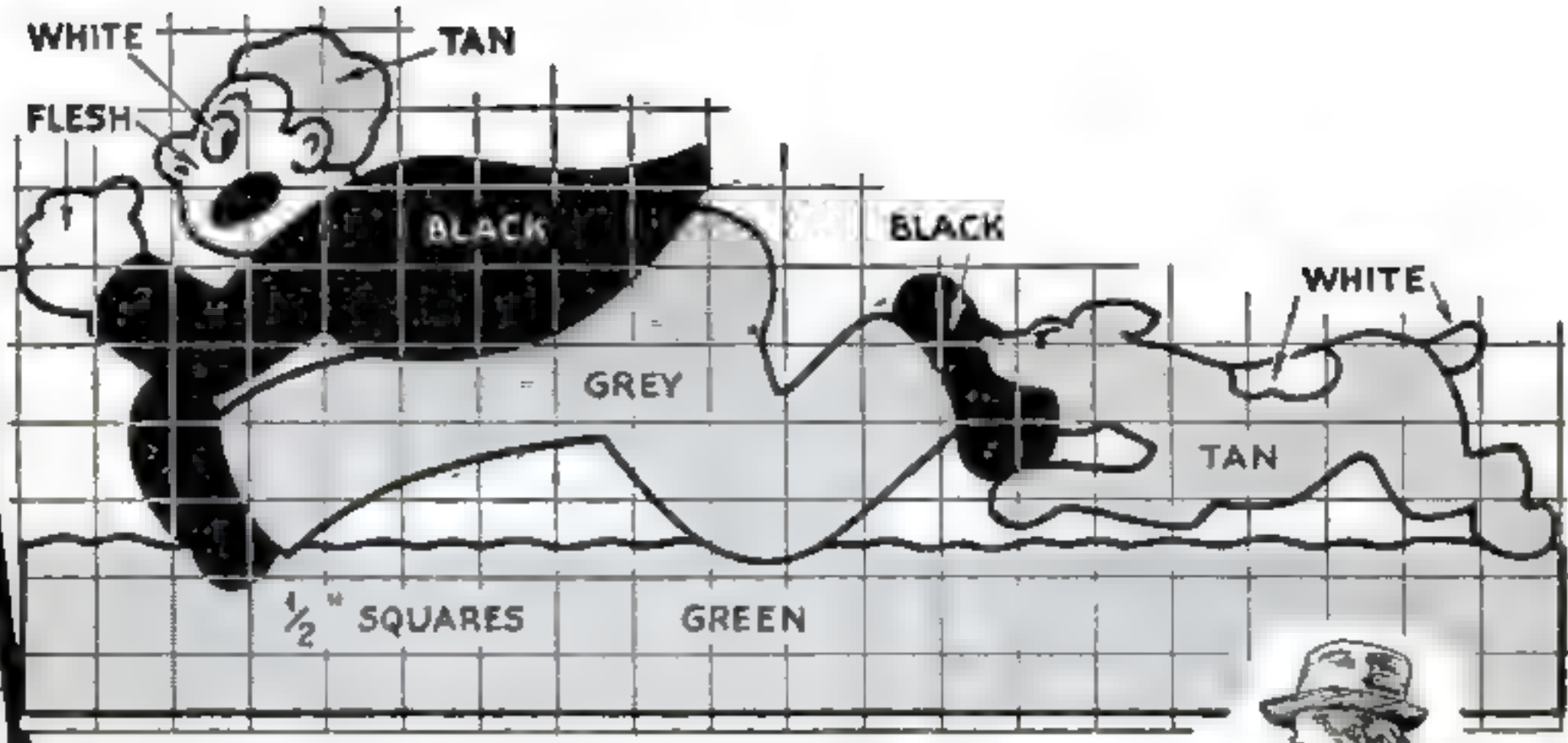
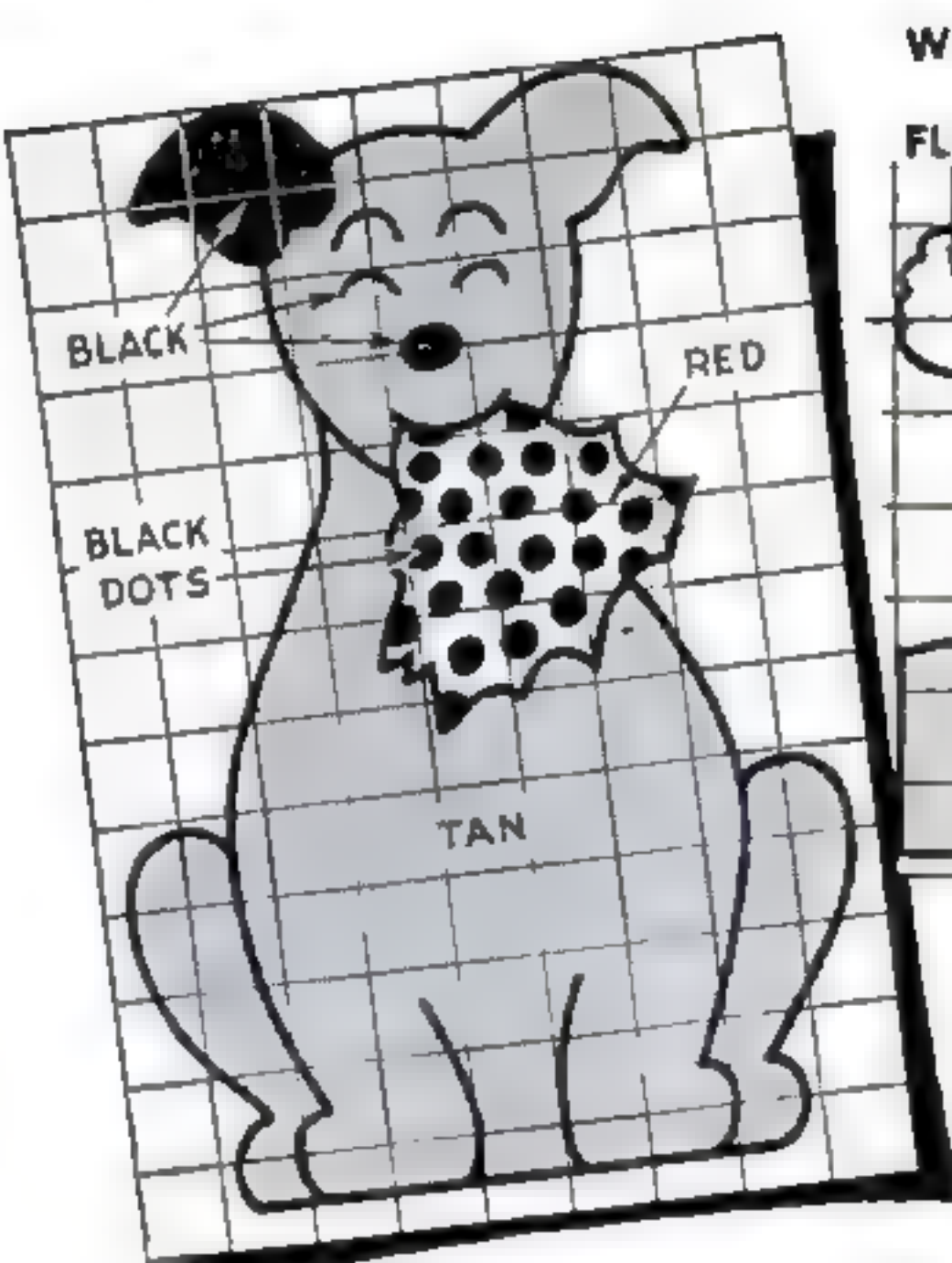
| Size . . . . .       | 2d | 3d              | 4d              | 5d              | 6d | 7d              | 8d              | 9d              | 10d | 12d             | 16d             | 20d | 30d             |
|----------------------|----|-----------------|-----------------|-----------------|----|-----------------|-----------------|-----------------|-----|-----------------|-----------------|-----|-----------------|
| Length (in.)         | 1  | 1 $\frac{1}{4}$ | 1 $\frac{1}{2}$ | 1 $\frac{3}{4}$ | 2  | 2 $\frac{1}{4}$ | 2 $\frac{1}{2}$ | 2 $\frac{3}{4}$ | 3   | 3 $\frac{1}{4}$ | 3 $\frac{1}{2}$ | 4   | 4 $\frac{1}{2}$ |
| Diameter common nail |    |                 |                 |                 |    |                 |                 |                 |     |                 |                 |     |                 |

### Approximate Number of Nails to a Pound

| Common nails and brads..  | 876  | 568 | 316 | 271 | 181 | 161 | 106 | 96  | 69  | 63  | 49 | 31 | 24 |
|---------------------------|------|-----|-----|-----|-----|-----|-----|-----|-----|-----|----|----|----|
| Casing and box nails ..   | 1010 | 635 | 473 | 406 | 236 | 210 | 145 | 132 | 94  | 88  | 71 | 52 | 46 |
| Finishing nails . . . . . | 1351 | 807 | 584 | 500 | 309 | 238 | 189 | 172 | 121 | 113 | 90 | 62 | .. |
| Flooring brads . . . . .  | ...  | ... | ... | ... | 157 | 139 | 99  | 90  | 69  | 54  | 43 | 31 | .. |

POPULAR SCIENCE MONTHLY SHOP DATA FILE





Two designs for novel "keep out" signs. They are jig-sawed from plywood and fastened on a gate or against a fence or building

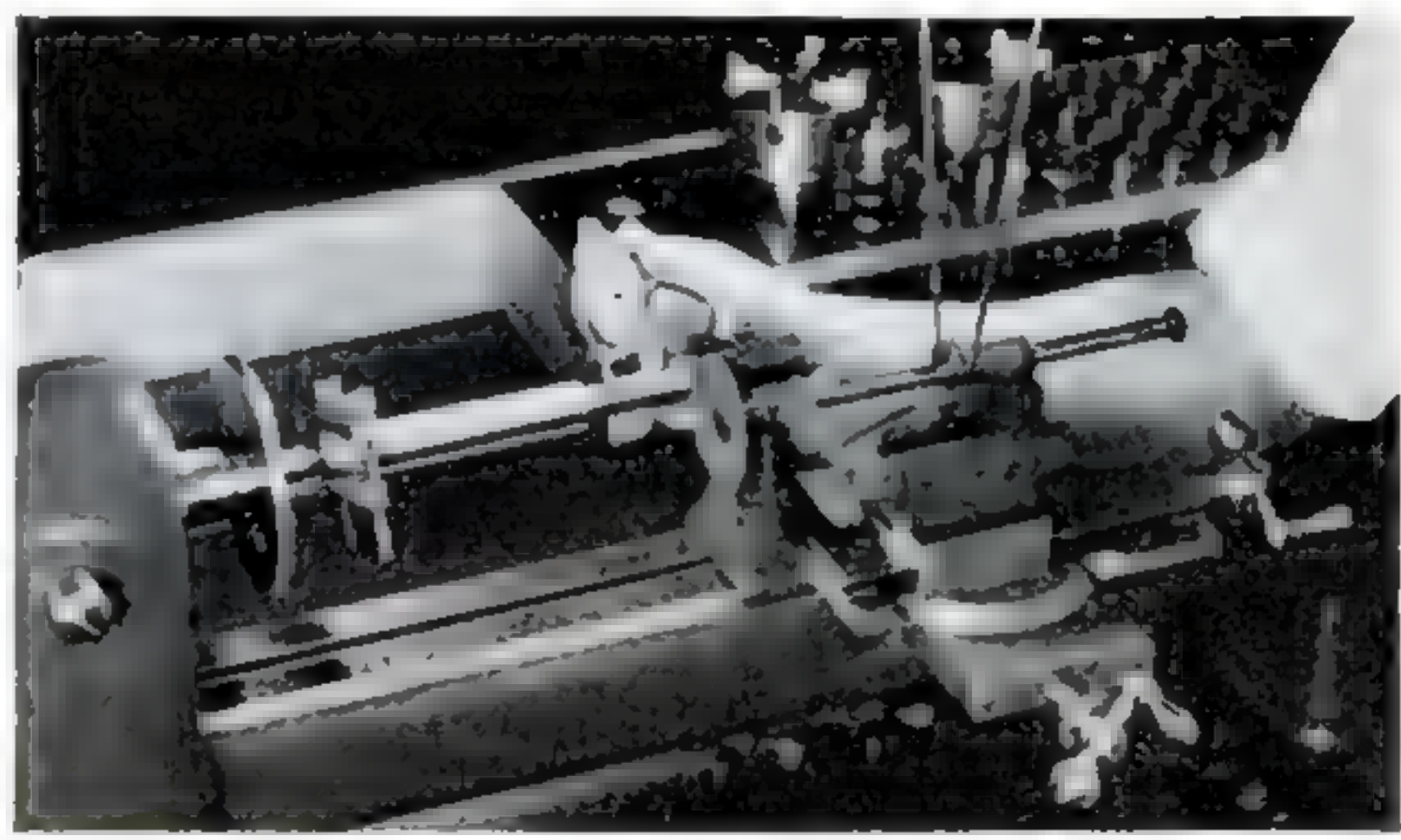
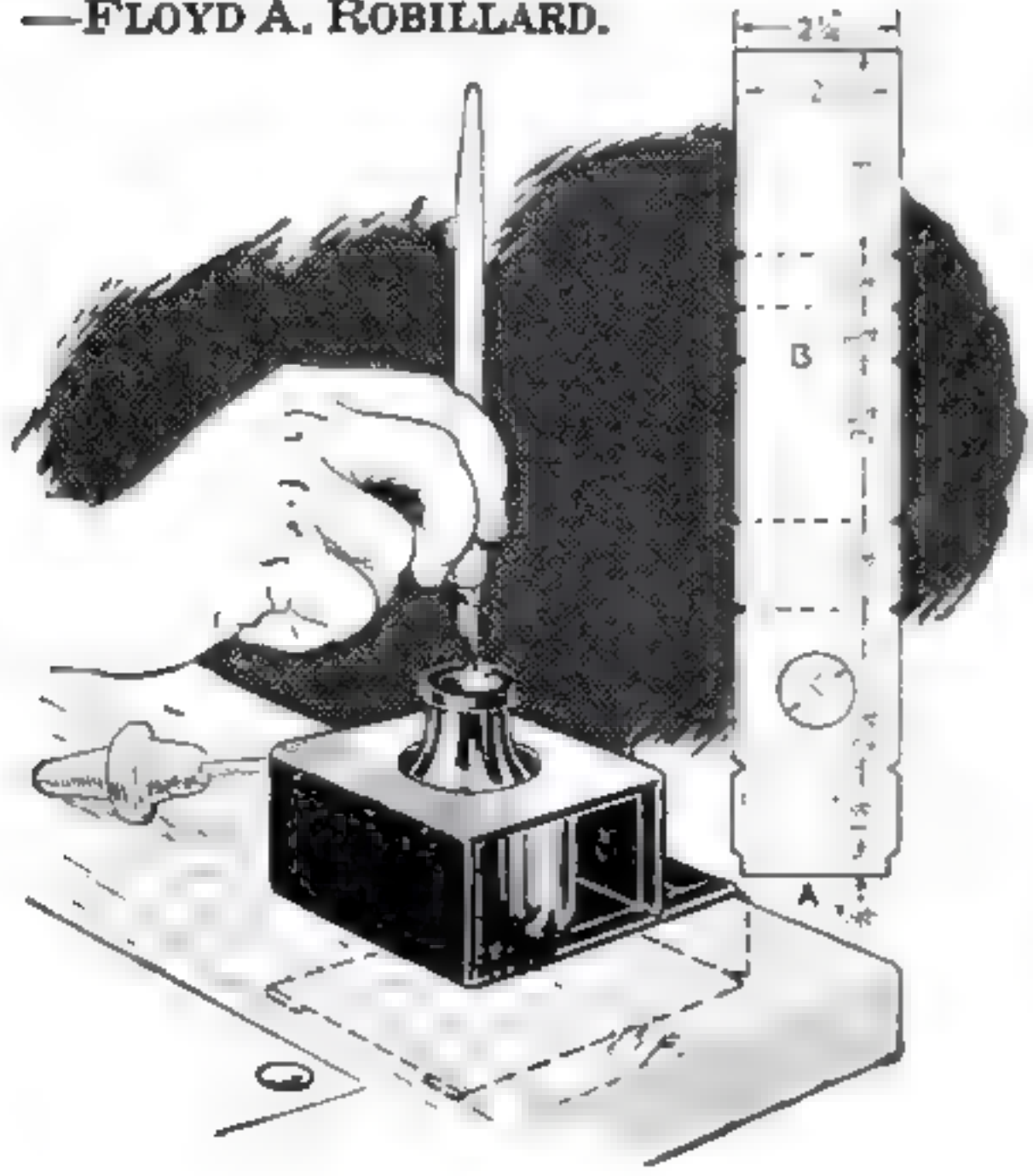
## Amusing Beware-the-Dog Signs

INSTEAD of a plain keep-out sign, a piece of scrap wood or plywood jig-sawed in one of the designs illustrated will serve as a warning that a dog is guarding the premises. Such signs will find a ready market among your dog-owning neighbors. The originals were made of  $\frac{3}{8}$ " plywood. The backs and edges were stained, and the fronts enameled in the colors noted. Two coats of clear spar varnish were then applied over all to protect the wood from the elements.—CARL L. SORENSEN.



## Ink Holder Clamps on Drawing Board

A SAFE, clamp-on type of ink-bottle holder for the drawing board or drafting table can be made from one piece of thin metal as shown. The lip marked A slides under the hem at B but is not otherwise fastened, so it is easy to change bottles. The original was cut from thin galvanized iron, then enameled black.—FLOYD A. ROBILLARD.



## Tool-Post Grinding Attachment

PRECISION in tool-post grinding is assured by the economical and somewhat unconventional set-up shown above. The spindle could be made from a discarded machine part, and the housing fitted to a base dovetailed for the swivel member of the cross-feed slide. In this case the spindle is operated at 5,000 r.p.m. by a steel drum driven from the line shaft. This speed is satisfactory for a 5" by  $\frac{1}{8}$ " rubber-bond grinding wheel.

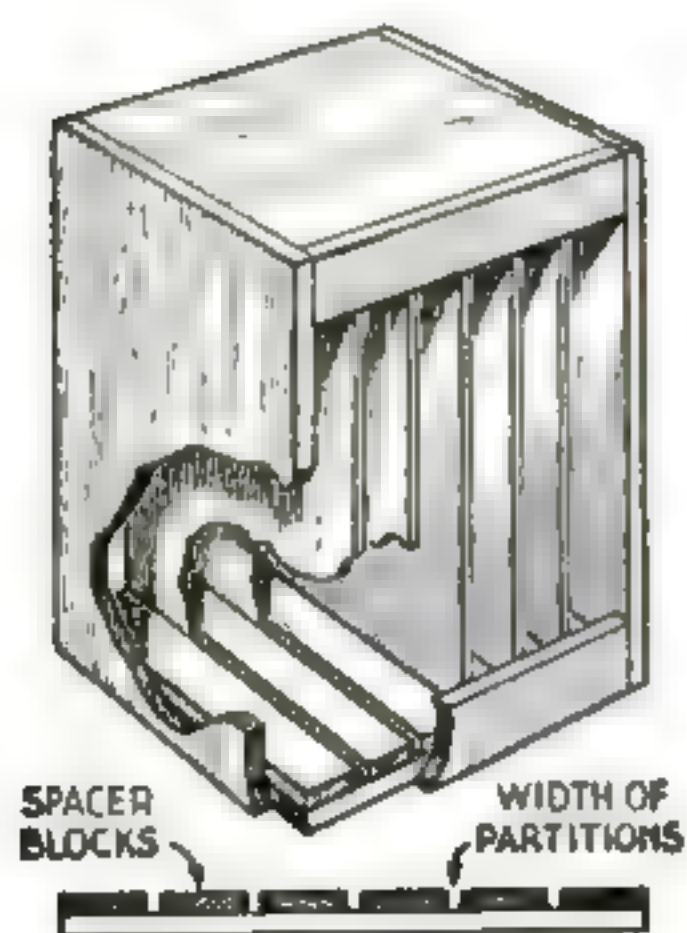
To work out a similar set-up for the home workshop, a 1,725-r.p.m. motor and a wooden drum may be used. The drum should be 6" in diameter and long enough to permit at least a 6" traverse. If the drum operates at the motor speed and a 2 1/2" pulley is used on the spindle, the surface speed will be satisfactory.



Trays for every purpose are kept handy on top of the refrigerator



## Cabinet Provides Place for Serving Trays



DETAIL FOR TOP AND BOTTOM PIECES

The cabinet is merely a box divided by thin partitions to suit the trays

SERVING trays may be kept out of the way yet quickly available in a cabinet of the type illustrated. The bottom and sides are  $\frac{3}{4}$ " lumber, the partitions either plywood, hard-pressed composition board, or even fiberwall board. The size and spacing should be designed to fit the trays in actual use, and a door may be added if desired. I put strips of wood,

as shown, along the top and bottom to improve the appearance as the cabinet is kept on top of the refrigerator. It is fastened to the wall with angle irons.—WILLIAM J. FRITZ, JR.

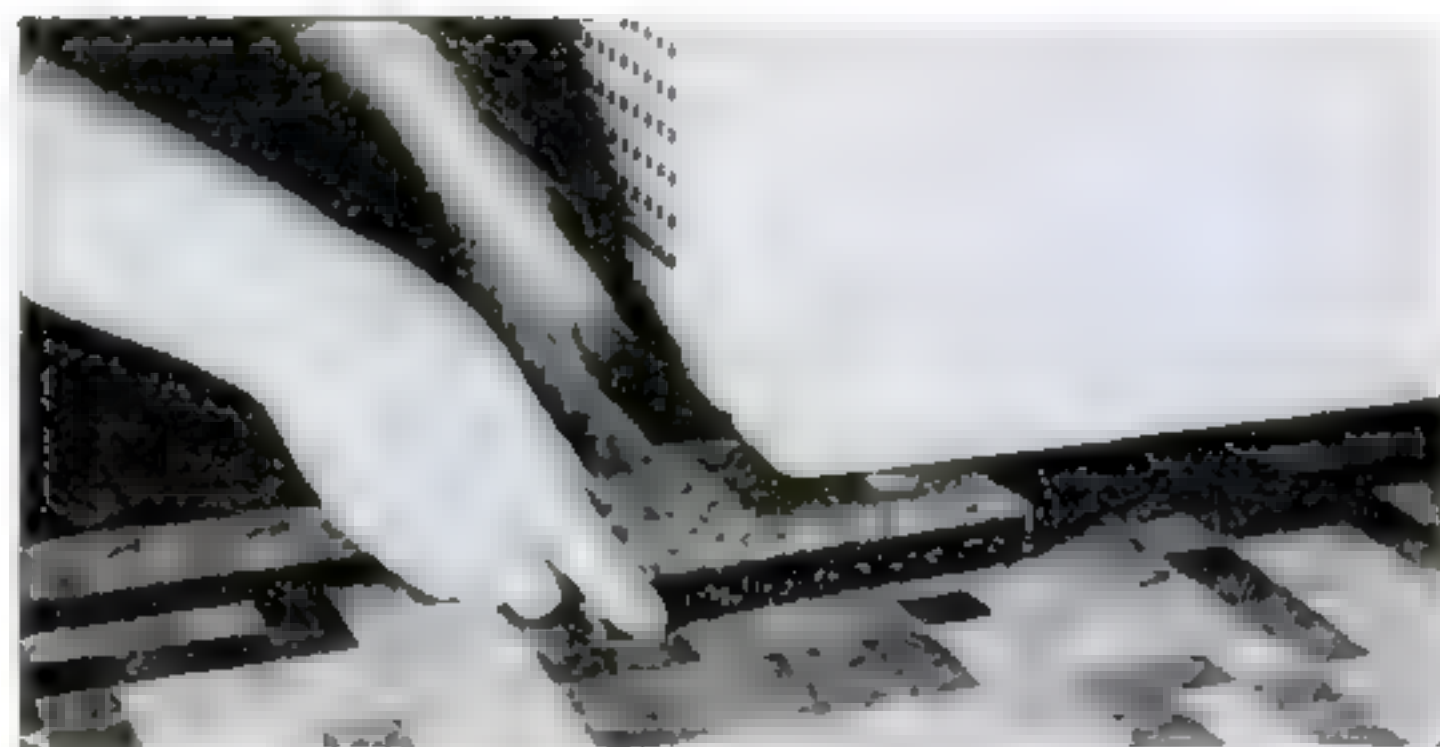
## Pipe Cleaner Used as Wick for Cigarette Lighter

IF YOUR cigarette lighter requires a new wick, you can save time by using an ordinary thin pipe cleaner. Because of its wire core, the cleaner can be pushed into place in a moment, whereas a wick of the usual type must be coaxed into the hole.—W.C.W.



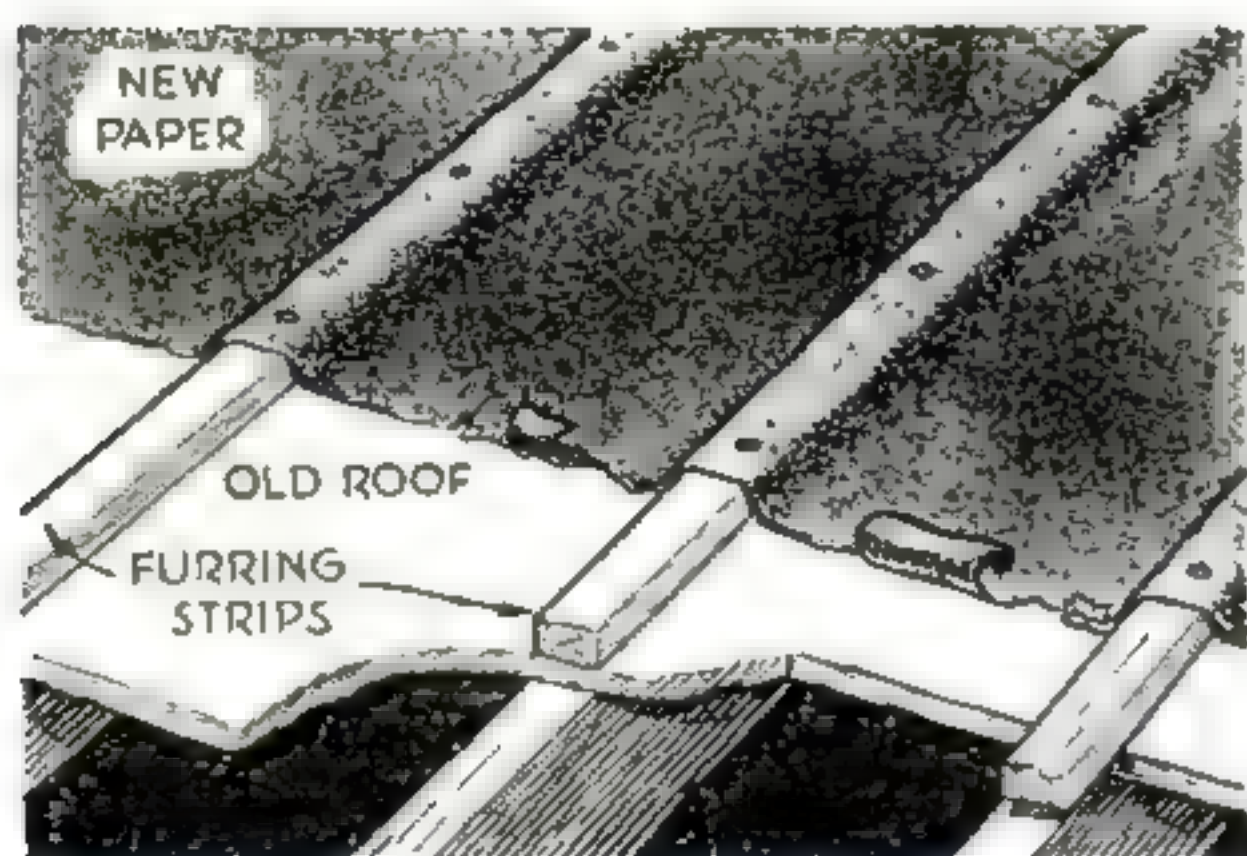
## Silencing the Vibration of an Old Refrigerator

ELECTRICAL refrigerators, especially those of the old types, sometimes get noisy, and if they are placed where the floor joists are weak or the span of the joists is unusually long, they may set up an annoying vibration. In bad cases the vibration can even be felt in the window sash of the second floor. This condition can be overcome or relieved by setting cross pieces of soft pine or 4" squares of  $\frac{1}{2}$ " thick insulating board under the corners. These are inconspicuous and will absorb the vibration.—JAMES F. SCHINDLER.



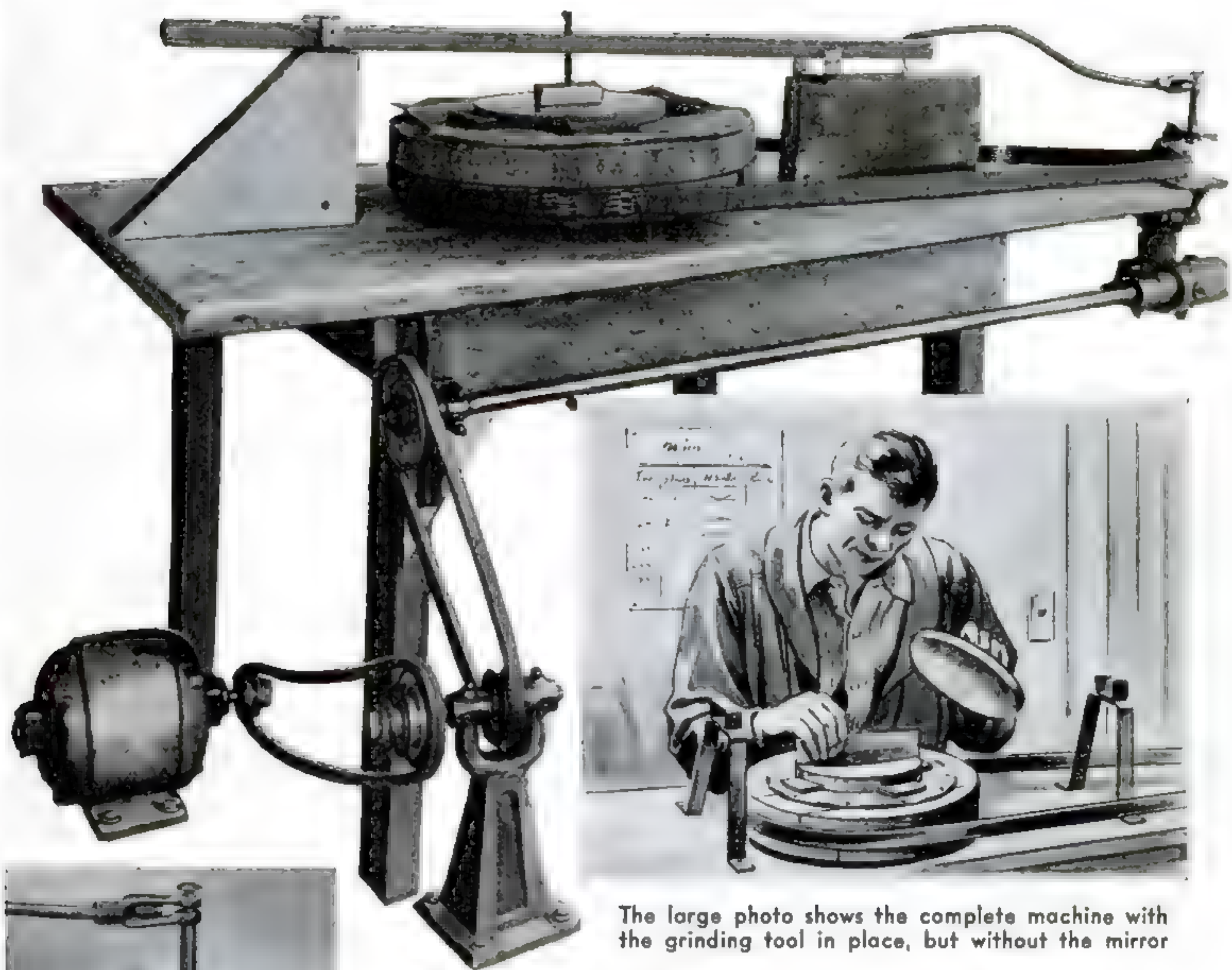
Crosspieces of soft pine or squares of insulating board absorb the vibration of a noisy refrigerator

## Leaky Shed and Barn Roofs Repaired at Low Cost



SHEDS, farm shops, and old barns often have badly leaking roofs, yet are not worth the cost of a first-class new roof. In one such case a temporary repair was made about nine years ago, and the roof is still shedding water. All that was done was to nail  $1\frac{1}{4}$ " by 2" furring strips over each rafter from ridge to eaves and apply tar-paper roofing over them, running similarly from ridge to eaves. All the nailing was done on the furring strips, and the paper was pressed down between the strips. The joints and nailheads were tarred, and the ends of the paper well lapped over the ridge.—W. F. MESSENGER.

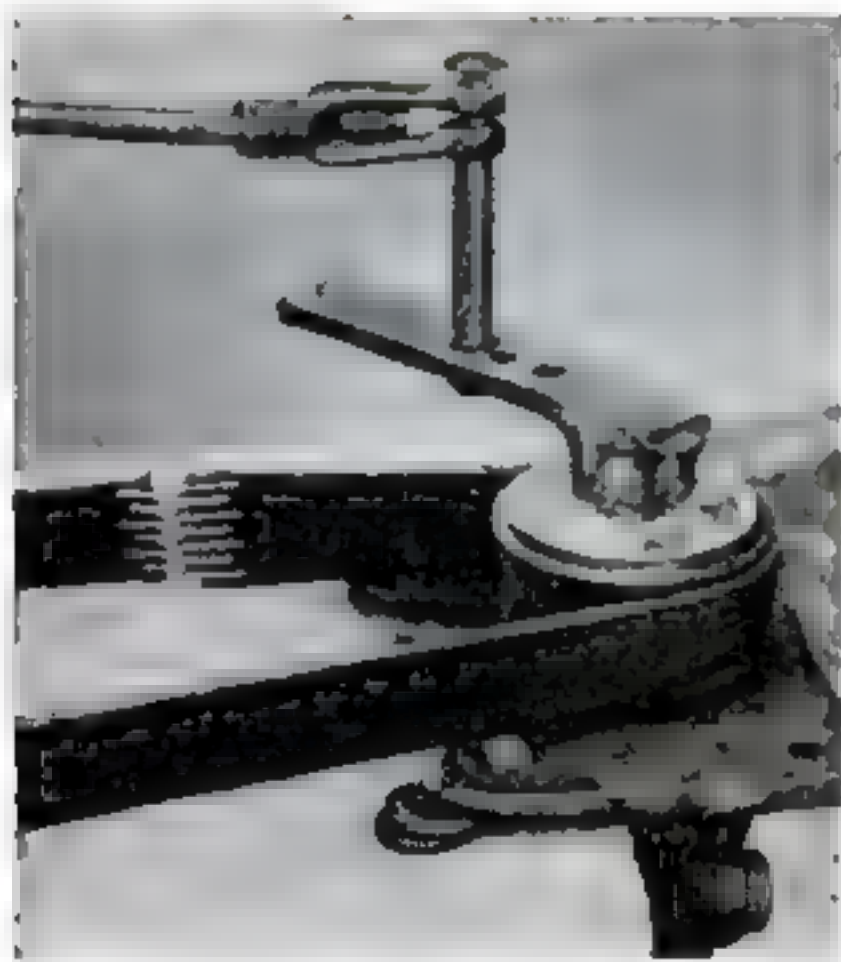




The large photo shows the complete machine with the grinding tool in place, but without the mirror

MACHINE GRINDS AND POLISHES

# Telescope Mirrors



**P**ROSPECTIVE telescope builders may save themselves hours of tedious hand labor by constructing a grinding and polishing device of the type illustrated. It is designed for 8" or smaller mirrors.

A 1923 Chevrolet steering column of worm-gear type provides a continuous turning movement of the turntable at the rate of seven revolutions a minute, and the grinding tool is moved across its diameter at forty strokes a minute. The spool on the steering arm serves as a pulley, and a 6" arm is welded to a nut that screws on the end of the arm above the pulley.

A belt runs from the pulley to the rubber-covered turntable. This is 16" in diameter and composed of two 2" by 8" planks crossed by

two others of similar size. A  $\frac{3}{4}$ " floor flange is attached in the center of the underside, and a  $\frac{3}{4}$ " by 10" nipple is screwed into the flange. The nipple passes through the bench and turns in a ball-bearing race.

To move the grinding tool, a 1" by 2" wooden crossbar is bolted to the 6" arm above the pulley by means of a piece of brake rod and a nipple. The  $\frac{1}{4}$ " bolt is fastened to the arm in a position to give a 3" offset and provide a 6" stroke. The machine is driven by a  $\frac{1}{4}$ -h.p. motor through a countershaft made from an old polishing mandrel.

After the mirror blank has been ground, the whole surface is carefully cleaned, and the grinding tool is replaced by the pitch lap for polishing.—PAUL M. BALDWIN.

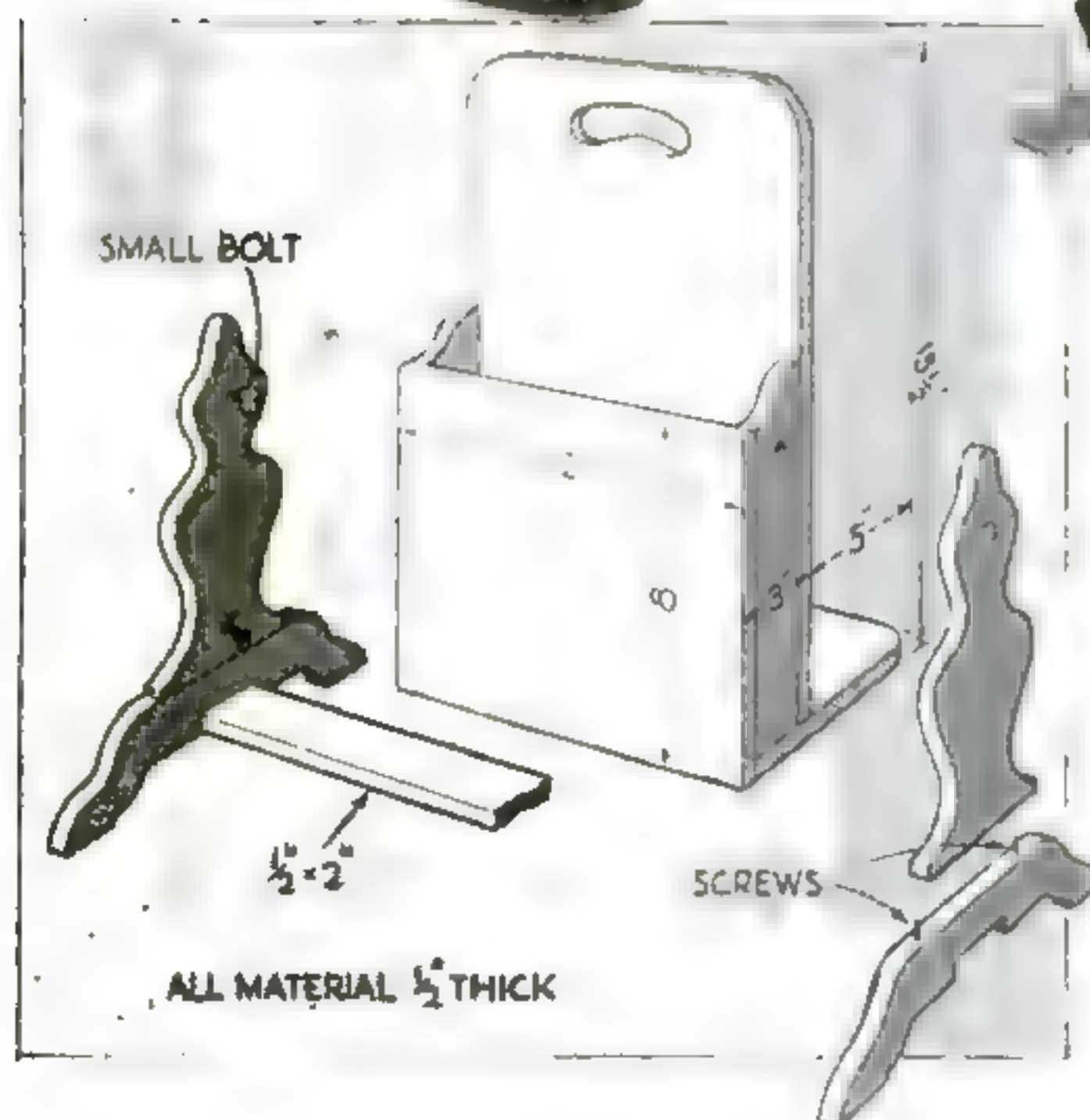
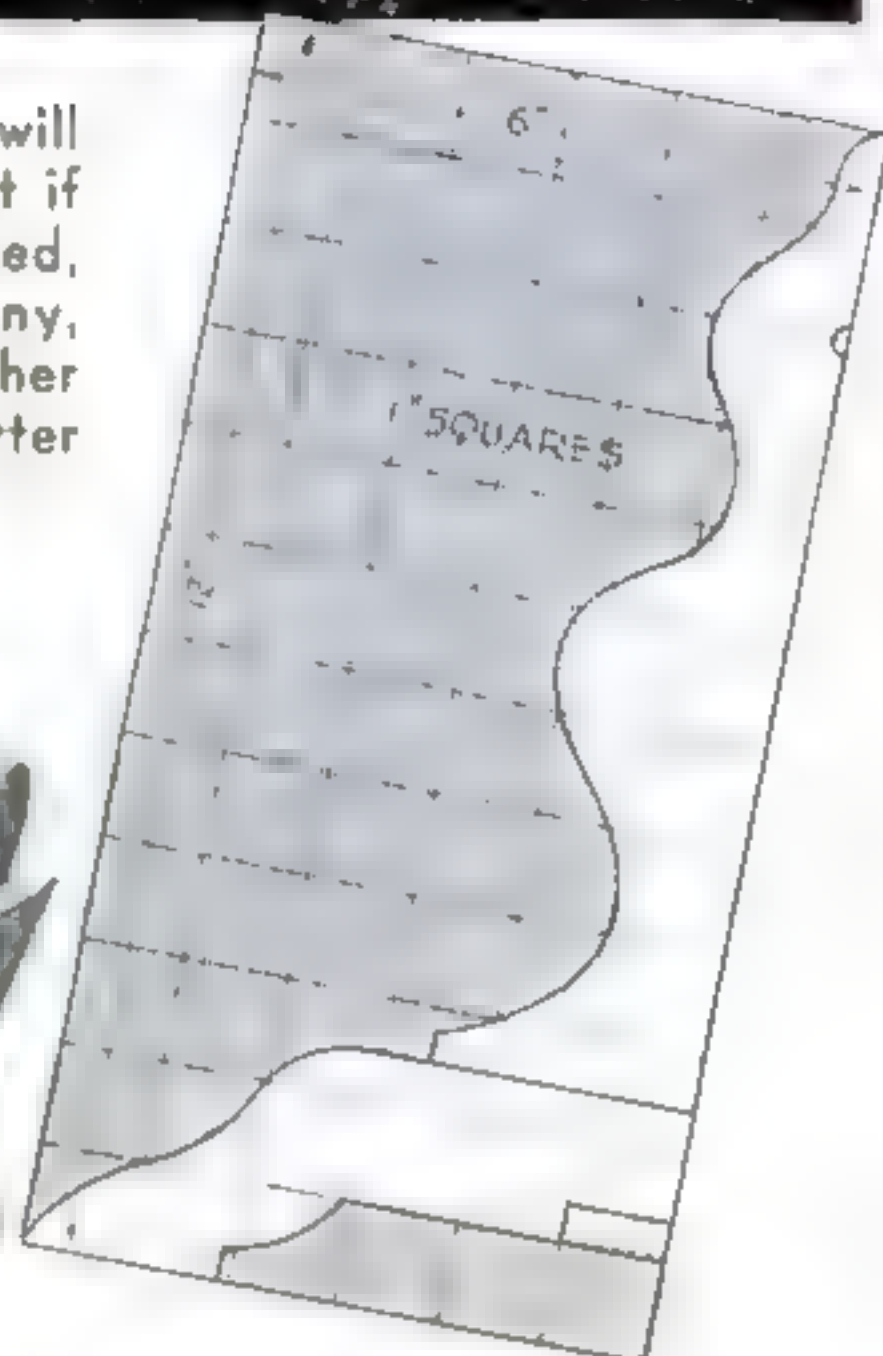


# "Lazy Leg"

## FOOT REST AND MAGAZINE RACK



Almost any wood will do for the foot rest if it is to be painted, otherwise mahogany, maple, gum, or other cabinet wood is better



FOOT rests of the so-called "lazy leg" type are made in many styles, both with and without magazine holders, but here is a new and unusually attractive design. Unpainted gumwood  $\frac{1}{2}$ " thick was used for the one illustrated, but a similar foot rest constructed of knotty pine has proved just as popular. The parts are assembled with finishing nails and glue, and the rack is pivoted on either a small bolt with a countersunk nut or on a No. 7 oval-head wood screw.—L. R. BROWNE.

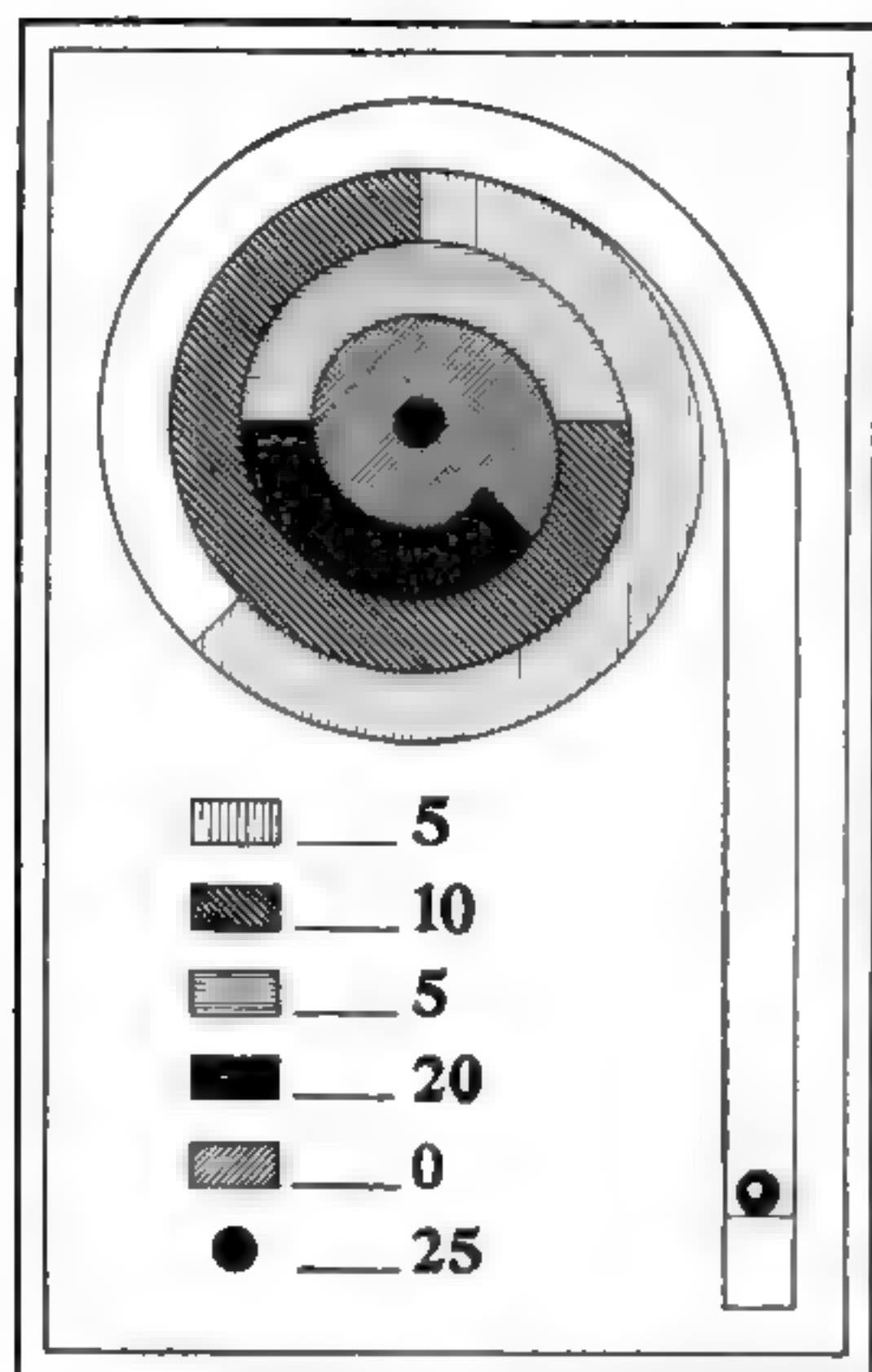
The earth for the plants is held in compartments made of furnace clinkers

## Dish Garden Built with Clinkers

NOVEL miniature gardens may be made with a few hard clinkers from the furnace, some Portland cement, and various small ornamental buildings, bridges, birds, and animals obtained at a ten-cent store. The clinkers are cemented in a platter, tray, or bowl so as to form small partitions. Then the ornaments are cemented in place, the whole painted, and plants set in.—W. J. FRITZ, JR.







# Twirl

... A MINIATURE  
MARBLE GAME  
WITH SPIRAL TRACK

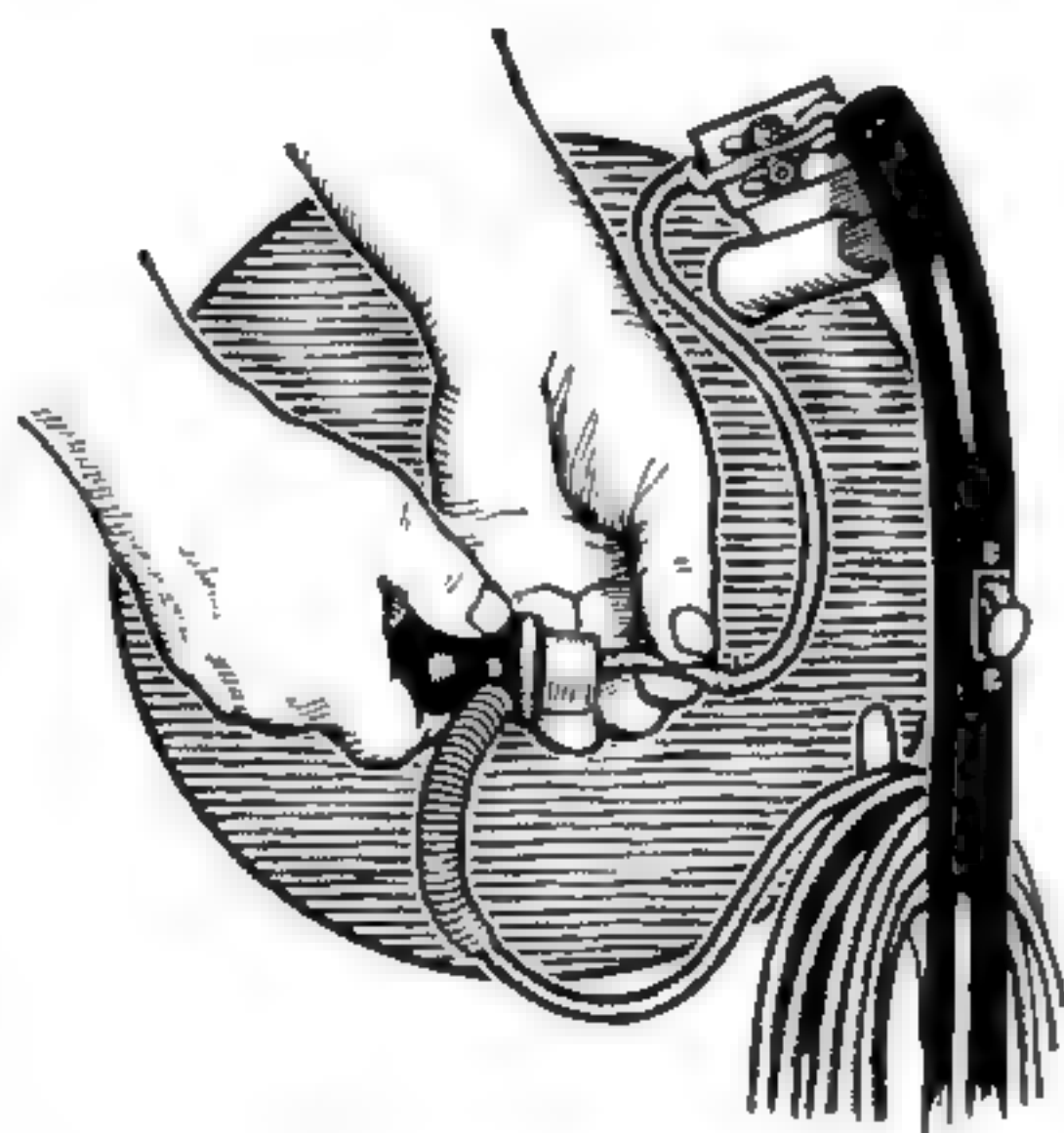
**A**N AMUSING little one-finger game may be made as shown from a 5" by 8" soft pine baseboard and some strips of thin cardboard fastened on with quick-setting model-airplane cement or household cellulose cement. The spiral track is marked into sections, and each is given a distinctive color. These are indicated in the drawing by shading of various tones. In the center a slight depression  $\frac{1}{4}$ " in diameter is made, and this is painted red.

Each player is allowed one twirl at a time.

He places his index finger against a small ball, such as one from a ball bearing, and gives it a quick push. If it stops before reaching the first dividing mark, he is allowed an extra turn. If it stops in the first division, the score is five; in the second division, ten; in the third, five, in the fourth, twenty, and in the central space, nothing, unless it comes to rest in the red dot, when twenty-five is scored. If the ball stops on a color dividing line, it counts nothing. Be sure the board is absolutely level.—DONALD W. CLARK.

## TESTING A VACUUM CLEANER

[ELECTRICAL]



When a vacuum cleaner will not run yet the motor armature turns freely and the brushes are in good condition, the trouble is usually due to a broken cord or a defective switch. Remove the necessary parts of the handle and feel the cord for a "soft" spot, which indicates a break in the wire. Test the cord, if necessary, by plugging it in and using a test lamp (see "Testing a Flat Iron," P.S.M., Dec. '38, p. 176). Cut the cord off at the break, if any, and make up connections as before. The switch may be removed for examination by disconnecting the wires and pulling it through the handle after loosening the retaining screws.

POPULAR SCIENCE MONTHLY DATA FILE



# Hobbyists, Attention!

POPULAR SCIENCE MONTHLY



OFFICIAL GUILD MAGAZINE

**NATIONAL HOMEWORKSHOP GUILD**  
347 FOURTH AVENUE, NEW YORK

Dear Fellow Craftsmen:

Do you want to get more pleasure and profit out of your workshop? If so, you'll find that membership in a home workshop club offers one of the best ways to do it. You can hardly realize the many advantages until you actually meet regularly with friends and neighbors who enjoy the same hobby. Talks and demonstrations by experts, moving pictures, and other program material are available free to clubs — benefits that an individual cannot obtain, even if he is willing to pay for them.

More than five years ago the National Homeworkshop Guild was organized just to help men like you. Full information on how you can start a club in your neighborhood will be sent free upon receipt of a stamped, self-addressed envelope. As soon as your club gets under way, you can participate in the Guild's many free services.

Here is what the Guild does for each club: issues a charter, supplies annual membership cards, provides national publicity, conducts a program service bureau, issues a monthly bulletin full of new ideas, distributes job sheets and other information, gives "A Manual for Home Workshop Clubs" to every new club, and publishes special bulletins on subjects of vital interest to members. All this is possible because of the tremendous growth of the Guild and the support it receives from its official magazine, Popular Science Monthly.

Now is the time to start a club, so use the accompanying coupon. We will be waiting to hear from you.

Sincerely yours,

C. A. Korch

C. A. Korch, Secretary

**National Homeworkshop Guild**  
347 Fourth Avenue, New York

Please send me complete information about your free membership plan. I am anxious to belong to the National Homeworkshop Guild and believe that a club can be started in my neighborhood.

For your use in sending me this material, I am inclosing a large (legal size), self-addressed, stamped envelope. I understand that this will not obligate me in any way.

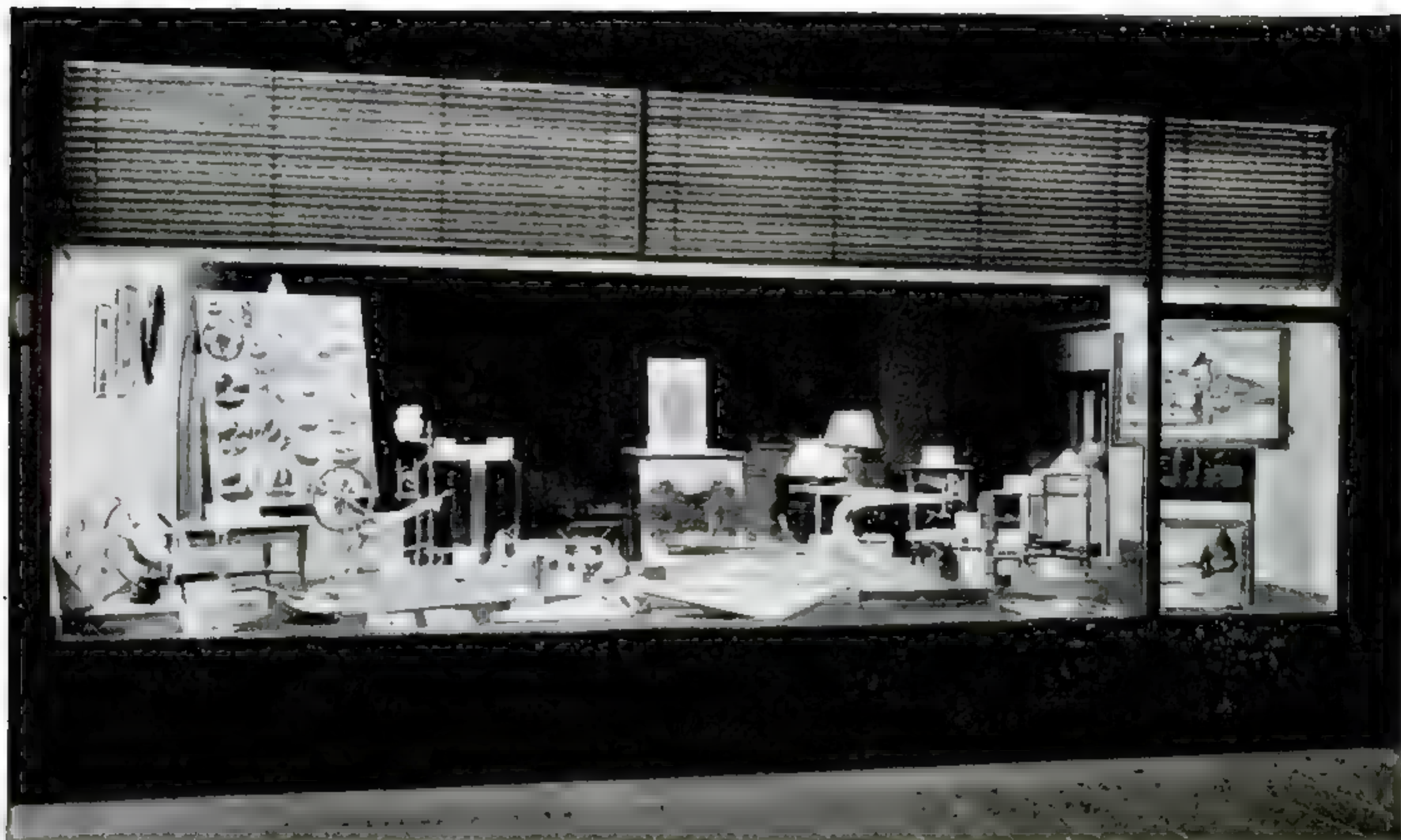
NAME.....

ADDRESS.....

CITY.....STATE.....

(Please print very clearly)





Annual exhibition in a store window of craftwork made by the Edison Homeworkshop Club of Chicago, Ill.

# Guild Starts Sixth Year

## WITH RUSH OF ACTIVITY

A SHORT distance outside Buffalo, N.Y., the Bison Builders Guild of that city, a club affiliated with the National Homeworkshop Guild, has just completed a small building to serve as its clubhouse. Bud Haberl donated the property, and the members chipped in to pay for the lumber.

There are two rooms—a shop 30' by 45' and a small library. Two long workbenches line the sides of the shop. Equipment includes a circular saw, jig saw, lathe, shaper, and hand tools, all purchased by the members.

Thirty men belong to this active club, which was organized less than a year ago.

Throughout the United States and Canada other clubs are enthusiastically forging ahead as the Guild begins its sixth year of existence. Reports at headquarters in New York indicate that club activities will be more varied



Members of the Rockford Homecraft Club, which holds Charter No. 1 in the Homeworkshop Guild, watch a lathe demonstration

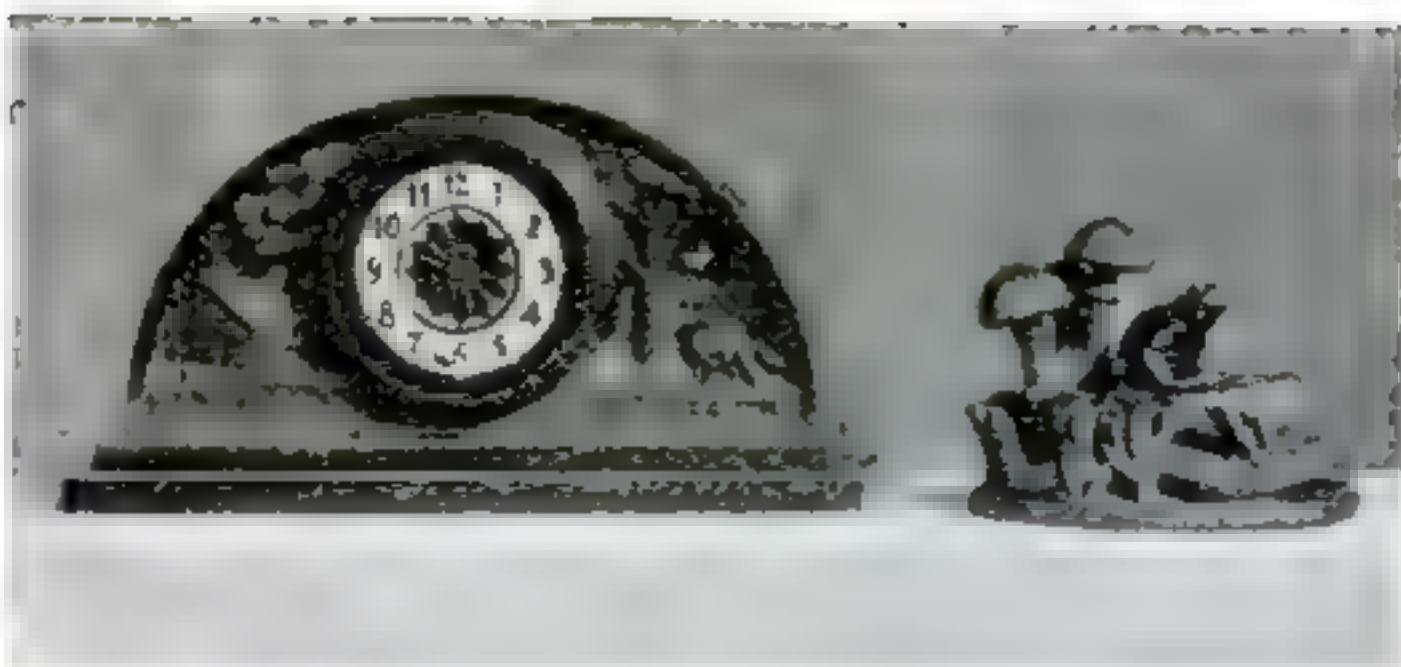
and intensified than ever before in its history.

The Mark Twain Homecrafters of Hannibal, Mo., have secured the coöperation of the local public library, and many home workshop books have been purchased for the use of members. Secretary A. O. Riley reports: "We have had a very good year. Organized





A. O. Stenwick, of Red Wing, Minn., puts a few finishing touches to a bowl he has carved. Above, two other projects



Littig . . . New officers of the South Shore Homeworkshop Club, *Quincy, Mass.*, are Parker Davis, president; Louis Sanders, vice president; Stephen H. Page, secretary; Alfred Moore, treasurer . . . A large number of Christmas toys were made by the *Louisville (Ky.)* Homeworkshop Club, which has been active in this work for several

years . . . The Ohio Valley Homecraft Club of *Wheeling, W. Va.*, has been enjoying a series of demonstrations on home workshop machinery, including the jig saw, circular saw, wood-working lathe, and metal lathe . . . At the annual social of the Tri-City Homeworkshop Club, *LaSalle, Peru,* and *Oglesby, Ill.*, R. J. Charles was named president, Earl Gealow, vice president, and A. Hammerich, secretary-treasurer.

"Safety Glass," a moving picture, was shown to the Town Hall Homeworkshop Club of *Ottawa, Ill.* Toys were repaired for the Red Stocking Club.

A professional wood carver and a man skilled in furniture turning demonstrated their crafts before the *Walla Walla (Wash.)* Homeworkshop Club. Each member attending a recent meeting had to make a gavel for some civic organization in the city.

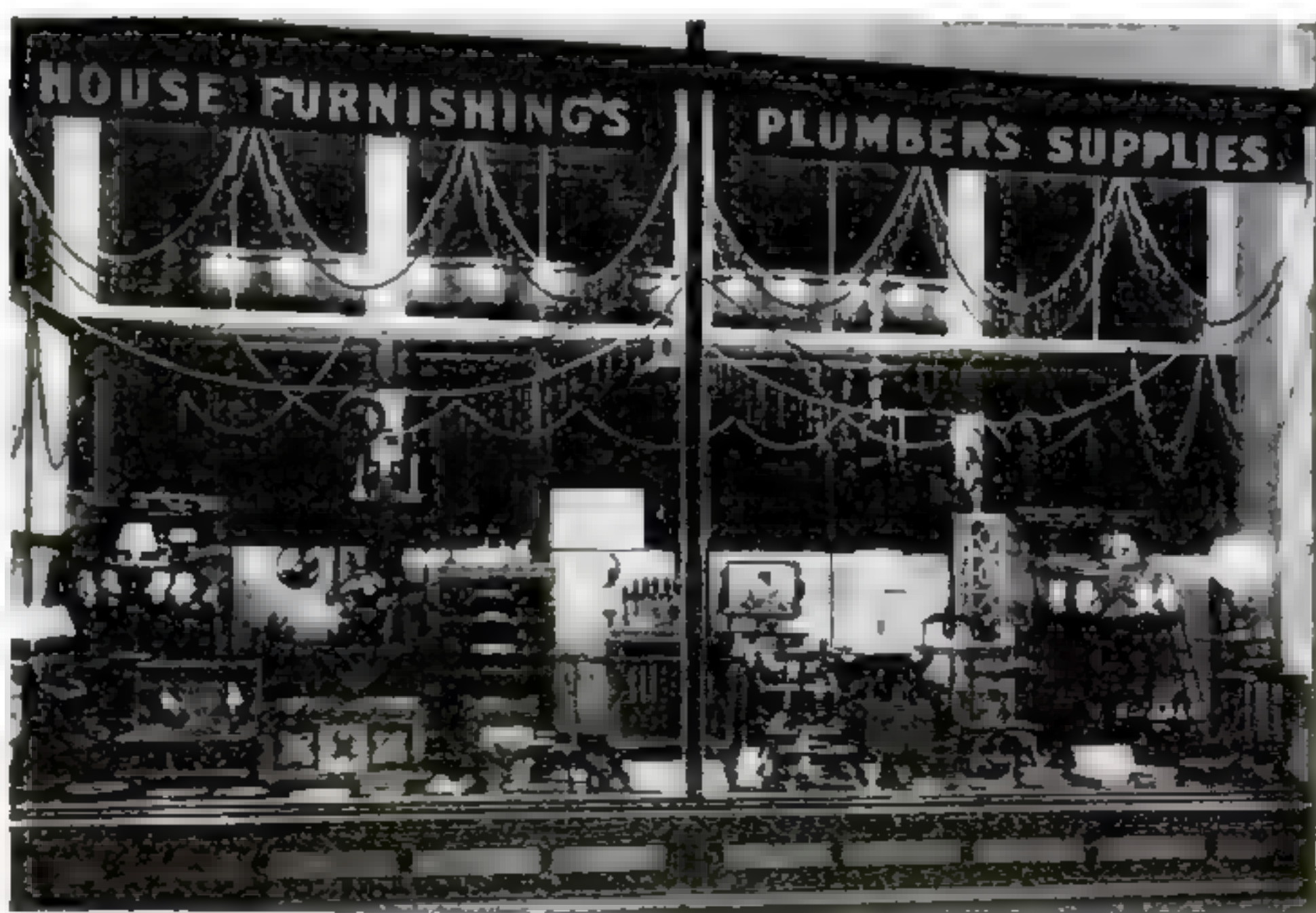
Stephen J. Milos was named chairman of the committee to plan a celebration of the National Homeworkshop Guild's fifth birthday sponsored by the *Ware (Mass.)* Craftsman Guild. He is assisted by Victor J. Charland and J. Henry McCarthy.

with thirteen members, we now have over forty. We receive hearty coöperation from the press, the library, and everyone else. Thirty toys were made and given to the Orphans Home for Christmas. We have had one picnic, a guest night, six demonstrations, and several good talks, and hope to do better this coming year."

The Mazda Homeworkshop Club of *Euclid, Ohio*, finds that the most satisfactory method of arranging programs is to assign each meeting to two members. Subjects covered include boat launching, pottery making, pinhole cameras, bird houses, and jig saws.

More than 15,000 persons attended the Wright Hobby Show in which the Passaic County Homeworkshop Club, *Hawthorne, N. J.*, participated. The club won a silver cup for the best group exhibit, and many individual prizes were captured by the members. Plans are already under way for next year's show. Hobby horses, small wagons, wheelbarrows, cabinets, ring-toss games, doll chairs, and mechanical toys were made for distribution to poor children at Christmas.

George H. Wilson was guest speaker at a recent meeting of the *Denver (Colo.)* Homeworkshop Club . . . Plans for the new year were discussed by the *Nutley (N. J.)* Homeworkshop Guild at the home of the president, Edward J.



Each year the club in Jacksonville, Fla., exhibits articles made by members and then sells them for the benefit of local needy children

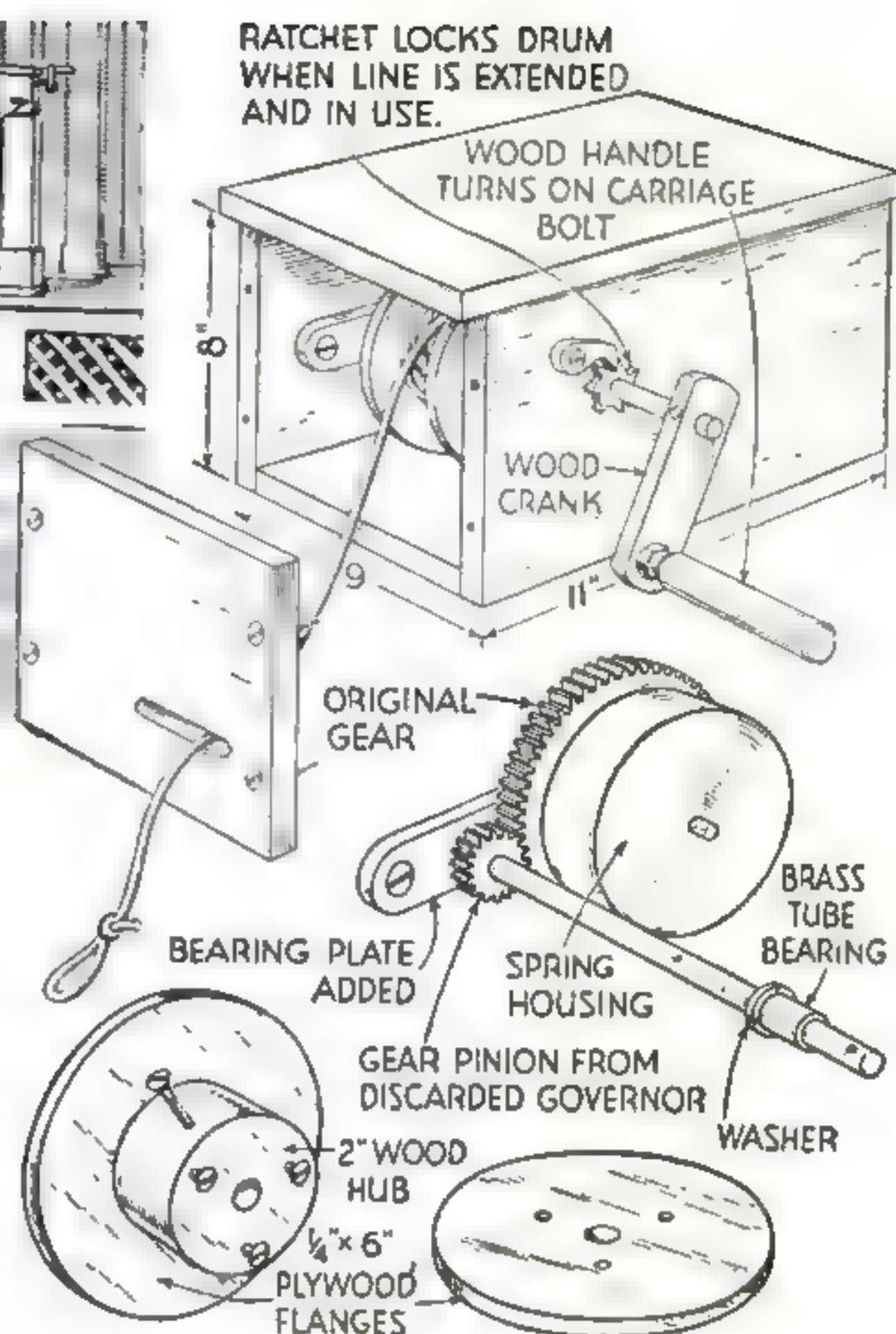




## Old Phonograph Motor Winds Clothesline on a Reel

DRIVEN by an old phonograph motor, this automatic clothesline winder literally swallows the line as the housewife walks toward it and thus prevents it from dragging on the ground. The wooden housing protects the line from the weather, soot, and dust when not in use. On wash days the line is simply pulled out and hooked on the other side of the drying yard. A hand crank is provided for tightening the line after it has been hooked.

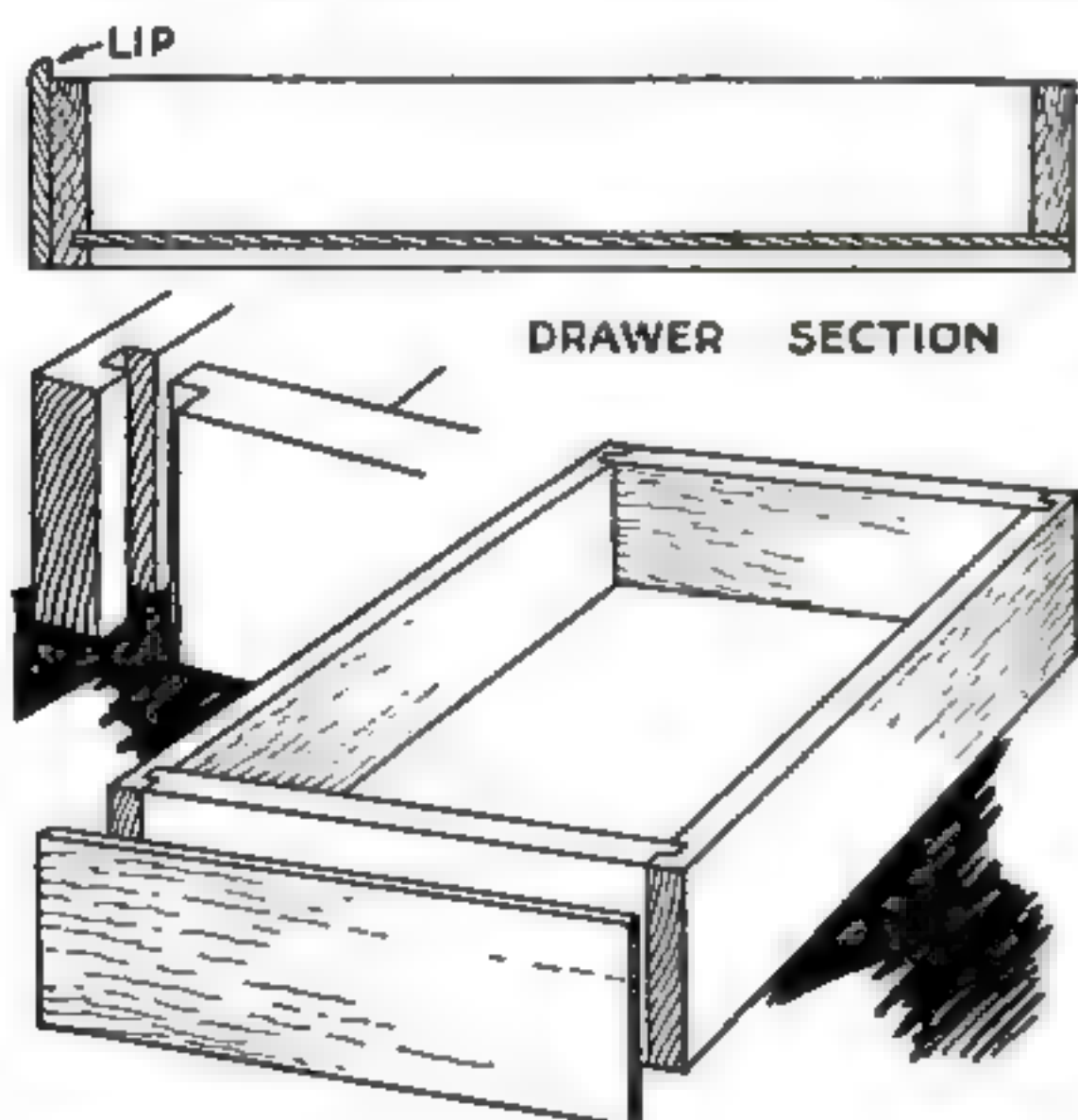
A spring phonograph motor, which provides the power, can be picked up in almost any junk yard. Remove the governor mechanism and any other parts not directly required. The remaining essentials are the main spur gear, the spring motor, and the housing. Locate a bearing plate for the winding shaft, and install the spur pinion as illustrated. On the shaft is mounted a wooden drum to carry the line, and a hand crank is required at the outside



How the spring-winding device is installed. The crank is merely for pulling the line taut

end. A ratchet from the original motor is also used on the shaft so that when the line is extended and the clothes hung, the drum remains locked. The hand crank has no other function than tightening the line.—DICK HIXON.

## DRAWER CONSTRUCTION, DADO AND RABBET [WOODWORKING]



Get out stock for front, back, and sides. For drawers of average size, the front may be  $\frac{3}{4}$ " thick, the other pieces  $\frac{1}{2}$ ". Cut dados in sides first, then rabbets in front and back. Cut  $\frac{1}{4}$ " grooves in sides and front,  $\frac{3}{8}$ " from lower edge, for  $\frac{1}{4}$ " plywood bottom. Cut the back  $\frac{5}{8}$ " narrower than sides. Glue corner joints, slide in the bottom, apply clamps, and place on flat surface while drying. Glue piece of  $\frac{5}{16}$ " stock to cover front, either flush or with projecting lips. Fasten bottom to back with brads.

POPULAR SCIENCE MONTHLY SHOP DATA FILE



These two huge fighting craft are the first ships of the so-called "battleship class" laid down by this country since the Washington Treaty went into effect almost twenty years ago. With a length of 750', a speed of over 28 knots, and a main armament of nine 16" guns, they will be longer, faster, and more powerful than any of their predecessors. Bulky as they are, however, the flaring bow, long hull, and well-balanced superstructure will make them graceful vessels, while the streamlined bridge and control tower will add much to their fine appearance.

Our model is based on the present





WITH PLANS FOR MODELS OF THE

# States Superdreadnoughts

NORTH CAROLINA

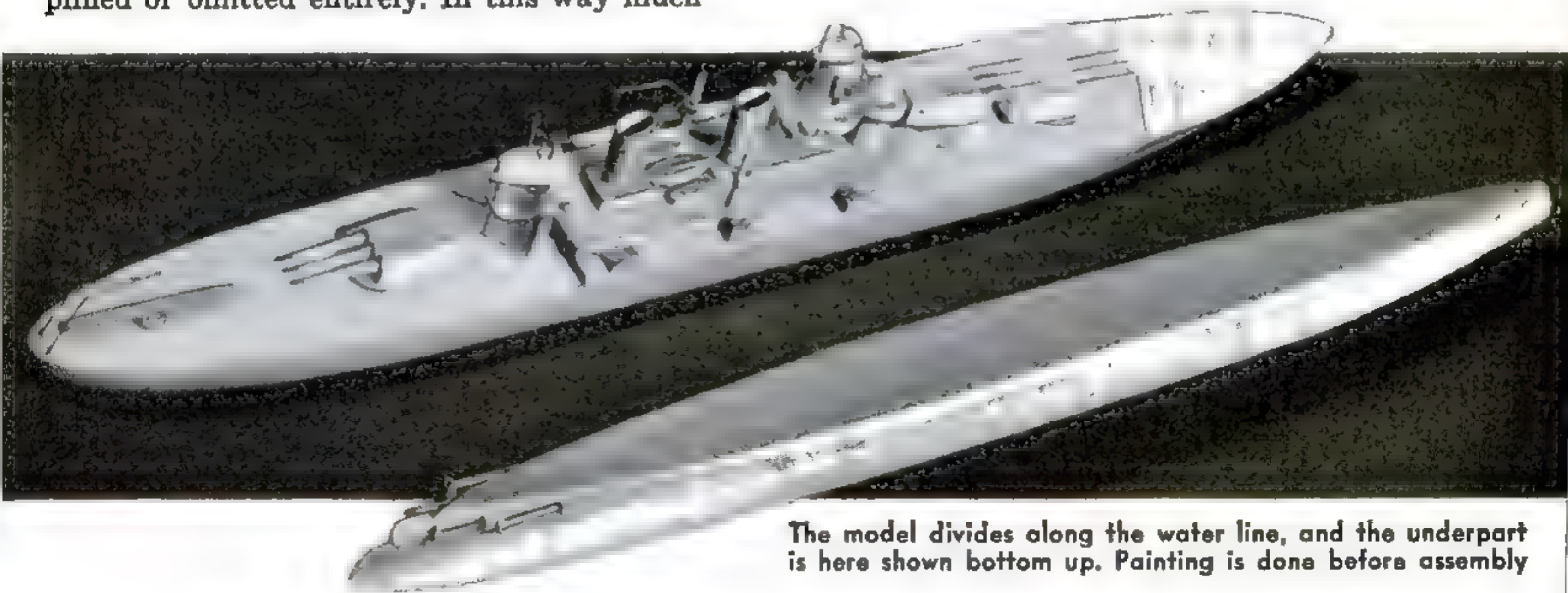
Prepared Especially for  
the POPULAR SCIENCE  
MODEL-of-the-MONTH CLUB

By  
**THEODORE  
GOMMI**

The finished model  
is 7½" long. It is  
shown full size in the  
working drawings

plans of these sister ships. It is possible that during their construction, which will take about three years, some minor modifications will be made, but the fundamental design will not be altered. All the important characteristics are included in the model despite its small size. It is built on a scale of 1" equals 100' and is only 7½" long. The small scale was chosen so that the countless minute details of the prototype could be greatly simplified or omitted entirely. In this way much

tedious and repetitious work is avoided. However, those readers who prefer a larger model can safely double all dimensions and the model will still look reasonably complete. It will also add a good deal to the realism of the project if two complete models are made, because warships never operate singly. The *Washington* and *North Carolina* will no doubt constitute a division of the battleship squadron



The model divides along the water line, and the underpart is here shown bottom up. Painting is done before assembly



when they are finally completed.

The construction is very simple. Since the drawings are reproduced full size, it is unnecessary to give dimensions. The model may be built merely from the water line up, but when made with the complete hull, it is advisable not to glue *A* and *B* together until after the painting is completed. Wooden pegs will hold these two parts together while the shaping and construction progresses. They are then separated and *A* painted black, while *B* and the superstructure are painted battleship gray.

The wedge *C* gives the hull its sheer. This should be glued to *B*, together with the forecastle deck *D*, before shaping the hull. The dotted line in the plan shows the shape of *B* at the water line, while the full line shows the contour of *D* at the deck.

The heavy guns are made from the tips of ordinary round wooden toothpicks. Glue them to the turrets evenly and absolutely parallel to the center line of the ship. The range finders on the turrets are short pieces of wire. The streamlined towers should first be shaped whole, then cut to make room for the bridges *K* and *O*. The platforms *L* and *LL* are attached by first cutting slots just deep enough to hold them.

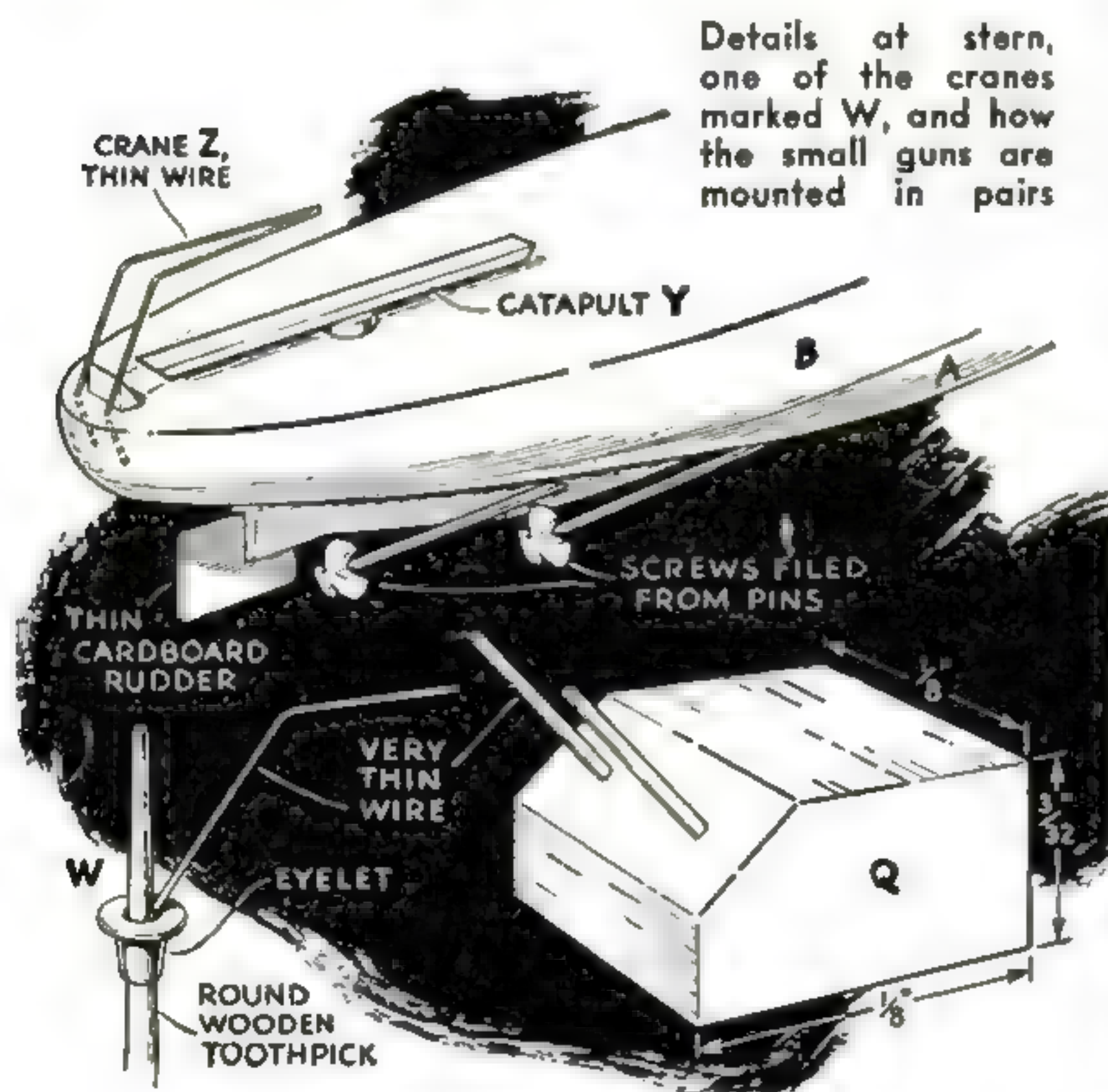
The screws or propellers are large pins with heads filed to shape. The seaplane crane is bent wire. The funnels can be made of



During construction, the two parts of the hull are kept together with dowels, but they are glued when the painting has been done

wood, though thin aluminum or brass tubing, if available, is preferable. The rudder, smoke deflectors, and the wave-breaker on the fore-deck are cut from thin cardboard or heavy paper.

A very fine drill will be found helpful for inserting masts and cranes, and for mounting guns in the small turrets.



## LIST OF MATERIALS

### WHITE PINE, BASSWOOD, OR Balsa

| No. Pc. | T.   | W. | L. | For                         |
|---------|------|----|----|-----------------------------|
| 1       | 1/4  | 1  | 8  | A, H, J, P                  |
| 1       | 3/16 | 1  | 8  | B, R, V                     |
| 1       | 1/8  | 1  | 8  | T                           |
| 1       | 1/16 | 1  | 8  | D, E, F, G, L, Q, and boats |
| 1       | 1/32 | 1  | 8  | C, I, N, U, K, Y            |

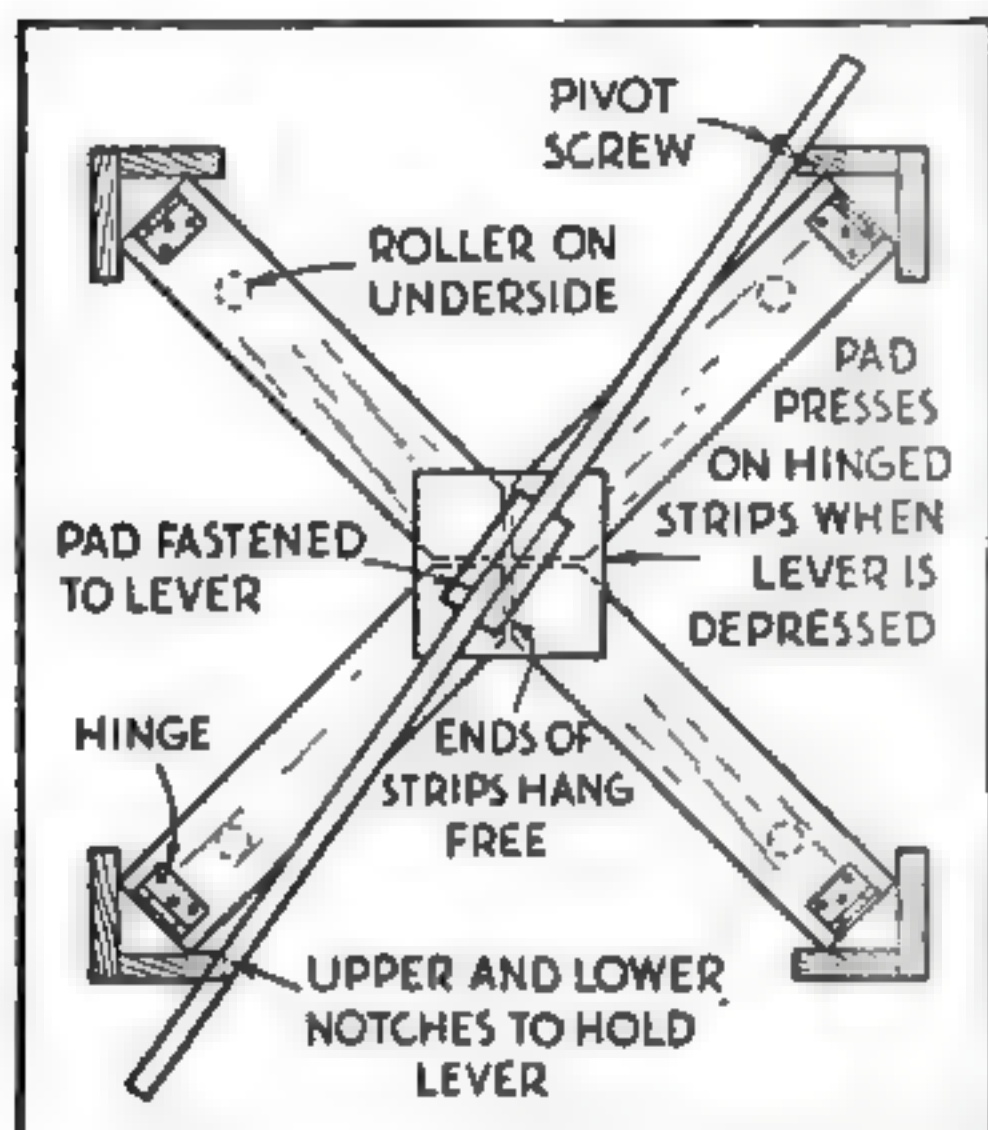
### MISCELLANEOUS

- 11 round wooden toothpicks for *W* and turret guns.
- 6 pins about 1' long for *X* and screws.
- 2 small eyelets for *W*.
- 7 small beads for searchlights, etc.
- 1' thin stiff wire for cranes, masts, small guns, etc.
- 1 small piece of thin cardboard for *LL*, *O*, *S*, *M*, rudder, deflectors, etc.
- Gray and black paint; glue or cement.



# Movable Benches

## SAVE SHOP SPACE



Plan view showing how the 2" rubber-tired casters are moved up and down by means of pieces hinged to the legs



When the lever is up, the table rests firmly on the legs; when it is down, the table rolls

**A**LTHOUGH my home workshop is only 9' by 12', it houses equipment that would tax the capacity of many shops twice as large. The secret lies in the manner in which the principal power tools are mounted.

The drill press and band saw are placed on opposite corners of a square, box-leg table equipped with a system of rollers, which can be easily raised or lowered. When the lever is in the upper notch, the table rests solidly on its own four legs, but as soon as the lever is pressed down and caught in the lower notch, the legs are lifted from the floor and

the weight rests on the 2" rubber-tired, ball-bearing rollers. In this position the table may be placed in the center of the room and turned to any convenient angle.

A similar table holds the circular saw and jointer. The lever-and-roller arrangement makes it possible to push the machines back against the wall when not in use, and jockey them around for handling long pieces. Lumber or metal longer than the room may be allowed to protrude through the window, which is equipped with a casement sash opening out, and a roll-up screen.—H.E.B.

## Sandpaper Kept in Letter File

VARIOUS types and grades of sandpaper and other abrasive paper and cloth are often kept loosely in a bench drawer or on a shelf, where they quickly get mixed up. It is better to place them in brown Manila correspondence folders. Write the name and grade of the abrasive on each index tab and keep the set of folders in a pocket-type folder of stronger material with a cover flap. This method of storing the sandpaper will also serve to some extent as a protection against dampness.—DONALD A. PRICE.

## Paraffin Protects Garbage Can

GARBAGE cans sometimes rust out at the bottom after a few months' use. To prolong the life of a new can, take a ten-cent cake of paraffin and melt it over the bottom and sides of the can. This will act as a rust preventive.—THERON G. CADY.





# HOW TO FINISH OR REFINISH

The rich color of red cedar is enhanced and preserved with an all-varnish finish. The first coat is thinned 50-50 with turpentine

..and those of  
other woods

## FINISHING NEW RED CEDAR CHESTS

[PAINTING]

1. Use no stain whatever, but seal the exterior with one coat of high-grade four-hour floor varnish mixed with an equal quantity of pure turpentine. Brush out well.
  2. Sand lightly with 6/0 paper when dry; dust off, clean with a tack rag (see "Tack Rag," P.S.M., Oct. '38, p. 187), and apply a full-body coat of floor varnish. Let dry from two days to a week.
  3. Fill cracks, holes, and defects with a glazing putty of one third dry white lead, two thirds whiting, colors such as burnt sienna, French ocher, and Van Dyke brown to match the work, and a few drops of varnish, all thinned to working consistency with gold-size japan. Let dry rock hard. Sand with 6/0 water-sanding paper and water. Dry overnight.
  4. Dust, use tack rag, revarnish. Let dry hard and rub carefully with pumice stone and oil. Clean off and apply a good furniture polish.
- The interior of a cedar chest is always left unfinished.

POPULAR SCIENCE MONTHLY SHOP DATA FILE

By **RALPH G. WARING**

**B**LANKET chests, clothes chests, cedar chests, hope chests—what a multitude of memories they bring to mind! Since they so often hold our treasured heirlooms or costly lace and linens, they should be well-constructed, and it is almost equally important that they be attractively and durably finished.

The accompanying specifications tell how to finish a new cedar chest and how to refinish an old chest of other woods than cedar. If an old cedar chest has to be refinished, the same instructions as for new cedar will apply, once the old finish has been removed. Conversely, a new chest of some other wood than cedar may be



finished as directed for an old chest, starting with operation No. 2.

Red cedar, with its dark red knots and almost bone-white sapwood, is a very striking wood. Under no circumstances should any attempt be made to stain it to imitate other woods or to shade out the sapwood to match the heartwood.

The natural cedar oil in the wood is a powerful solvent for gums and resins, and many types of sealers have been tried. In the accompanying specifications, it will be noted that the seal coat is a mixture of high-grade four-hour floor varnish with an equal amount of turpentine. This recommendation is based on tests made on large panels and exposed for ten years. The results were overwhelmingly in favor of using nothing but varnish as a finish on red cedar.

The glazing putty mentioned in the specifications should be worked out well on a sheet of glass or tin and then forced into place with a flexible glazing putty knife. Since this is done over the first full-bodied coat of varnish, the color matching can be very exact. Any excess putty balls can be kept indefinitely for future use in a glass jar under water.

When the filled spots have hardened and are being water-sanded, inspect them frequently "under water" by looking through a small puddle of clear water. This method will show up all imperfections.

If chest straps and other trim interfere with rubbing down, use eggshell varnish instead of gloss varnish for the final coat and omit the rubbing. The straps and other metal trim should be cleaned very carefully with steel wool, dusted off, inspected, and coated with bronze lacquer of the color known as "brushed brass." If it is applied with a soft bear or fitch brush, one coat will be sufficient. When a spray gun is available, mask the straps with paper and tape, then spray the metal with bronze in lacquer or in a superior grade of bronzing liquid. In general, it is sufficient to add one teaspoon of bronze to each two tablespoons of bronzing liquid. When this is dry, pull off the masks and inspect for any necessary touching up.

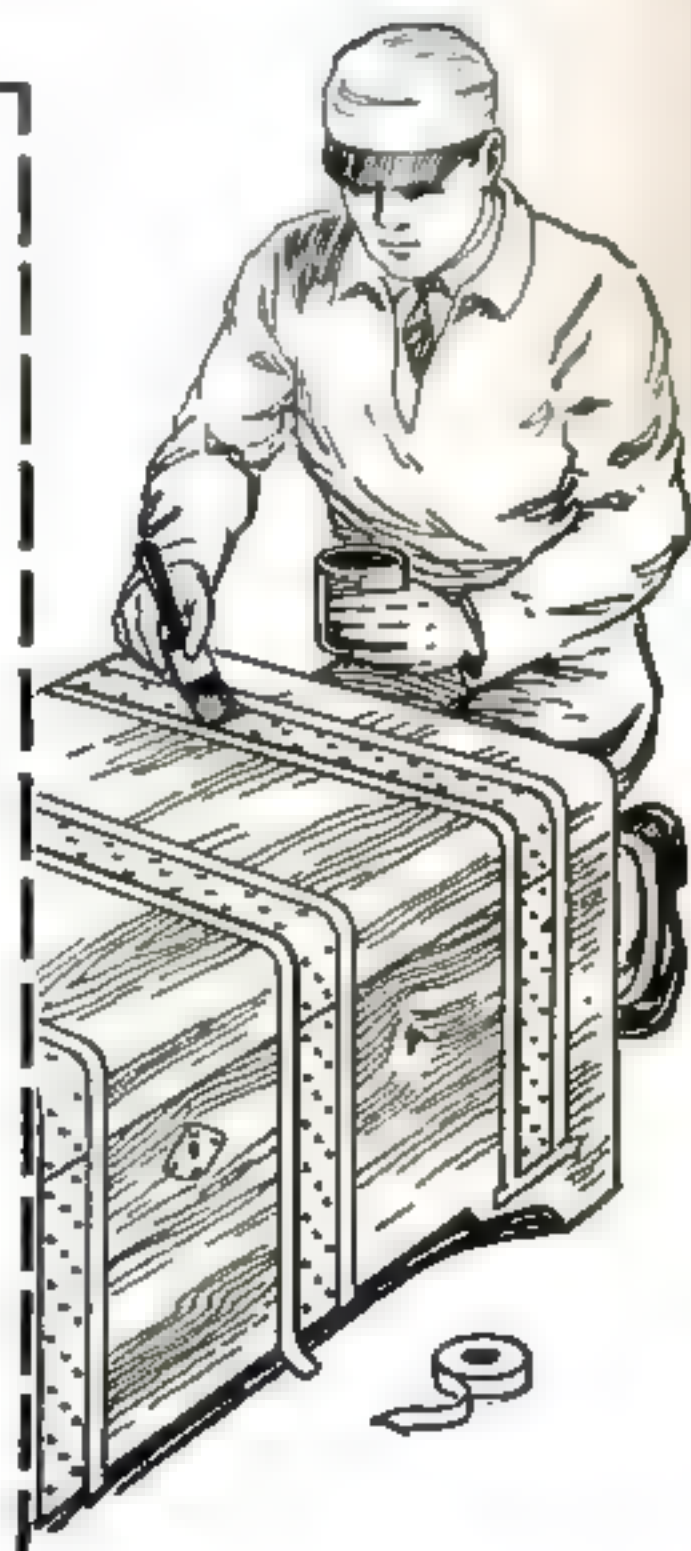


In restoring the beauty of old cedar chests, the first step is to strip off the finish with steel wool and denatured alcohol

## REFINISHING OLD CHESTS OTHER THAN CEDAR [PAINTING]

1. Remove metal trimmings and make any necessary repairs. Strip off varnish with No. 2 steel wool and denatured alcohol applied with burlap. Wash with clean alcohol and fresh rags. Sand with 4/0 paper in direction of grain.
2. Apply water stain of suitable color, depending on the exterior wood.
3. Dry. Seal with varnish reduced 50-50 with turpentine.
4. Sand lightly with 6/0 paper. Revarnish, full body. When hard, apply putty glaze where needed (see "Finishing New Red Cedar Chests"). Dry hard and water-sand.
5. Tack-rag off. Varnish full body, dry hard, and resand with wet 6/0 paper.
6. Tack-rag off. Revarnish with full-body gloss or eggshell varnish.
7. Rub with pumice stone and water or oil if gloss varnish is used. Inspect. Apply trim and assemble. Clean up with oil polish.

POPULAR SCIENCE MONTHLY SHOP DATA FILE





# Two-Rail Operation Adds

By HAROLD V. LOOSE

**M**OST of us are so accustomed to seeing model trains run on track having three rails that we hardly stop to think how unrealistic this is when steam-type locomotives are in operation. Electric trains *can* run on only two rails, one carrying the current to the motor and the other acting as a return. In fact, this method was used on some of the earliest electric locomotives—model and full-size. Today the idea is being revived on a scale undreamed of two or three years ago, and model railroaders of all tastes are flocking to the "new" system. It is cheaper, more realistic, and contrary to first impressions, no more complicated once the principles are understood. Unless you already have a great deal of three-rail track and equipment, it will pay you to consider these advantages when

planning future extensions to your model railway track-system layout.

To change over to two-rail operation, you must insulate every wheel on every car from its mate by one of the methods shown in the drawings. Insulated wheels and trucks are readily obtainable at prices little higher than the uninsulated kind in the popular HO gauge, and, to a more limited extent, in other sizes as well. New equipment thus takes care of itself, but it is necessary to replace or alter the wheels of whatever rolling stock you already have on hand.

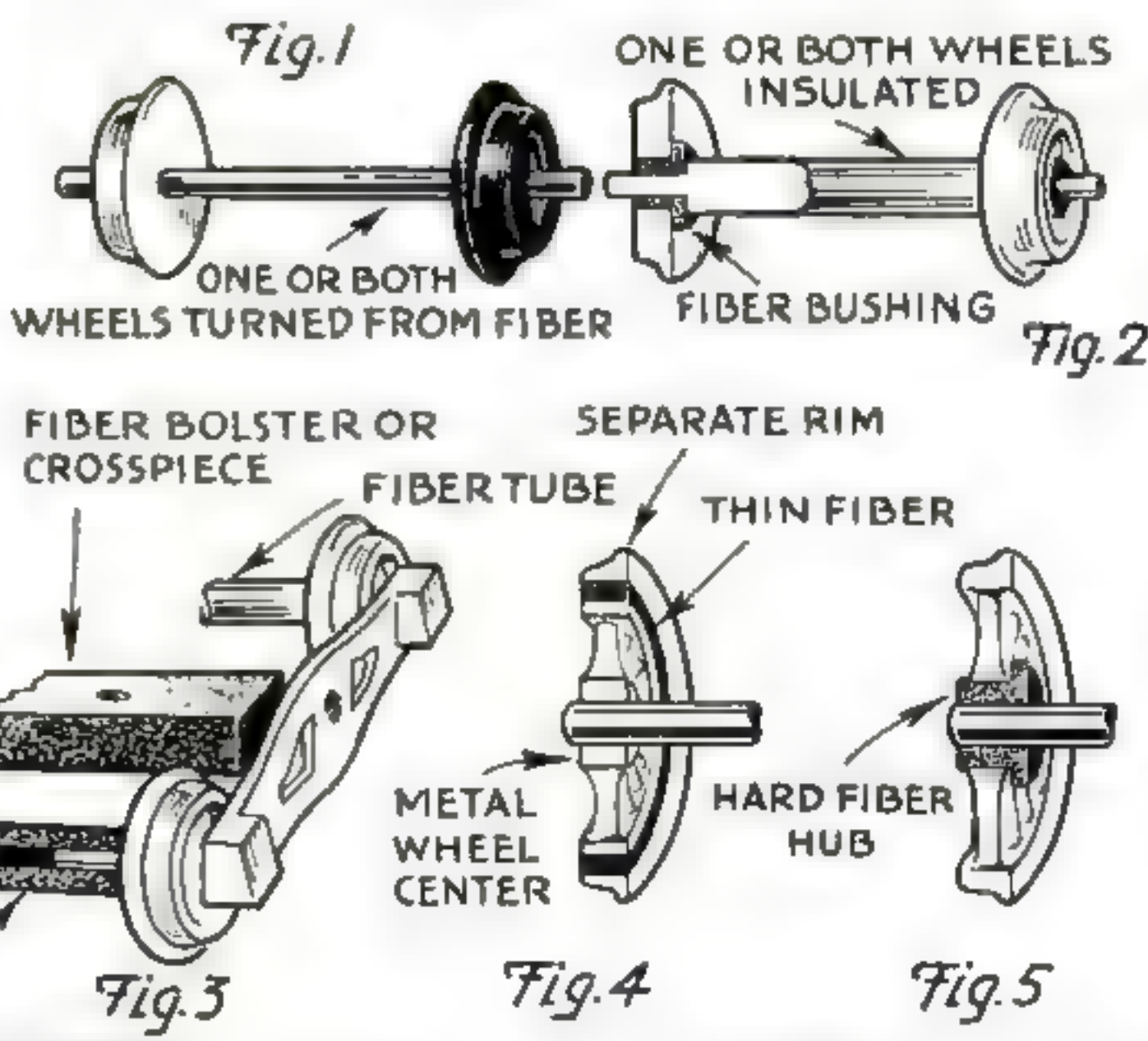
Locomotives, too, must be changed. Here the problem is more complicated because it is necessary to provide a current supply to the motors. The usual way is to insulate the wheels on only one side of the locomotives by the method suggested in Fig. 4, then to insulate the wheels on the opposite side of the tender. Connected as shown in Fig. 6, the motor picks up current from each rail.

No special insulation is needed for track\*, if it is laid on wooden or cardboard ties, except at switches and crossings. Even at these

\*For general information on track, layouts, control methods, equipment, and accessories, refer to "Model Railways Handbook" (Popular Science Publishing Co., Inc., New York, price \$2.00).

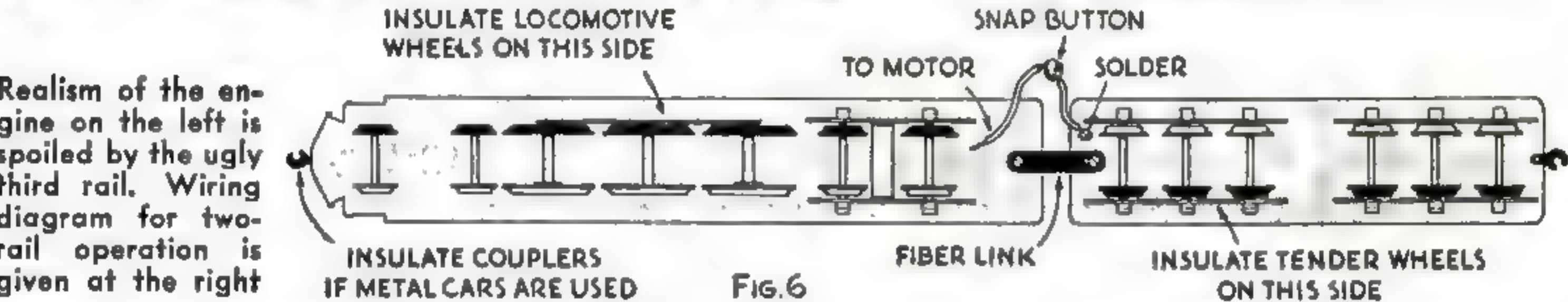
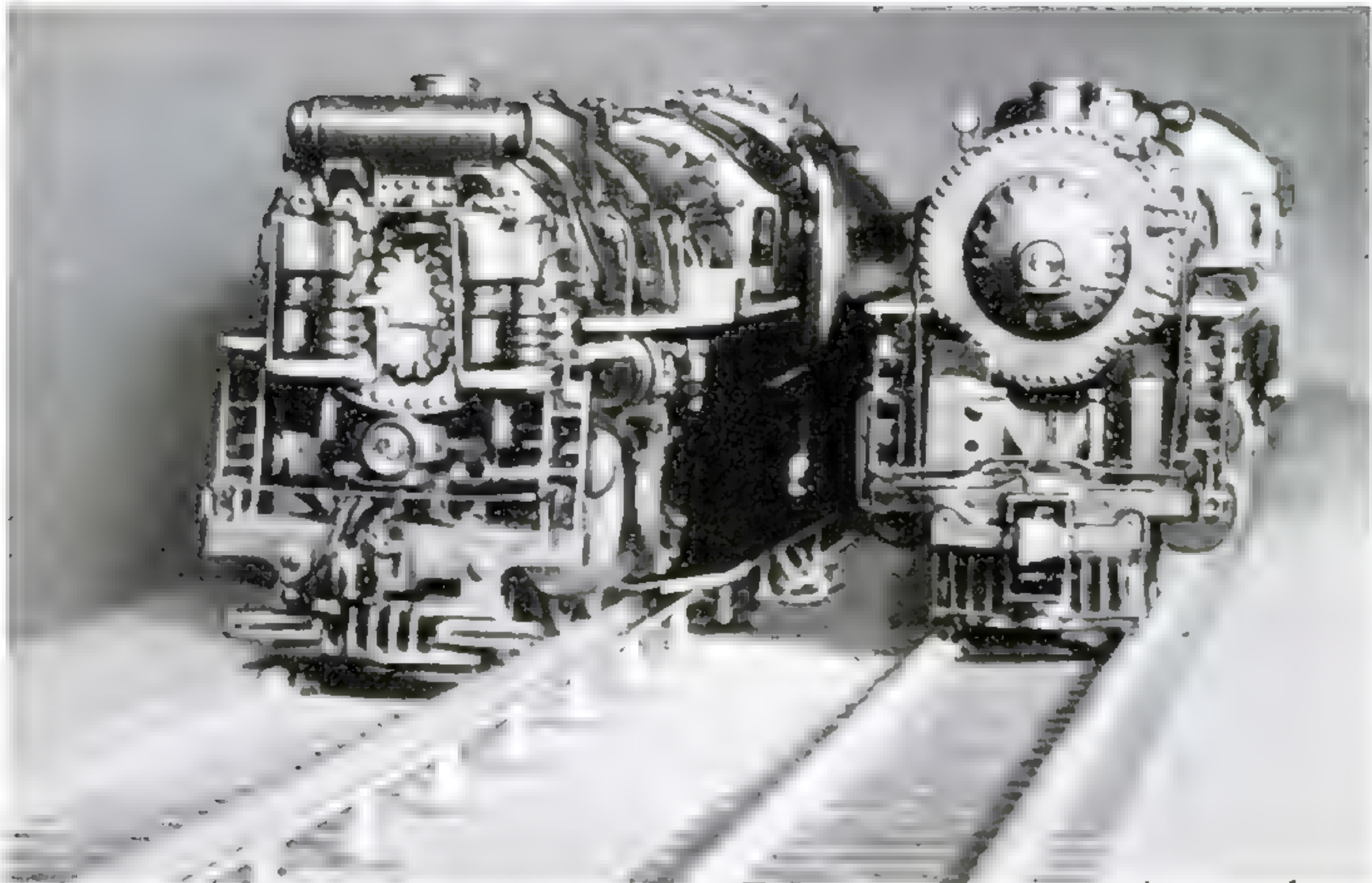


Insulated wheel and axle; wheel is cut away to show bushing. A locomotive wheel insulated by the standard method is in the lower left corner. Above it a driver is being cut down so a new rim can slip over, with fiber between



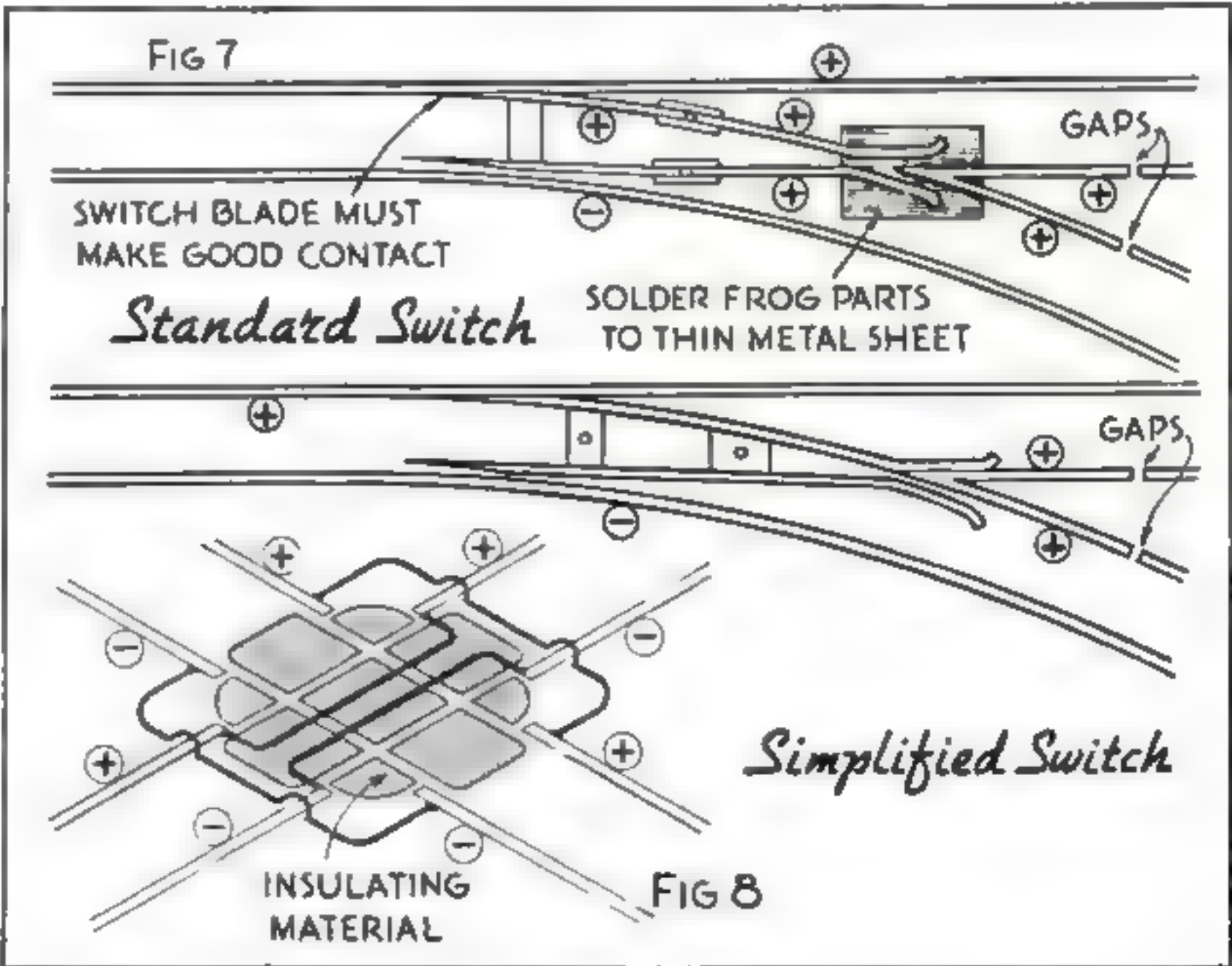


# Realism to a Model Railway



points, as the drawings show, the connections are extremely simple. In a switch, it is necessary only to see that the points make good contact with the running rails when set to either side, and that gaps are provided behind the frog.

In making a crossing, the simplest way is to construct the parts at the center from nonmetallic material. Hardwood is easy to use and works perfectly, or a phenol-formaldehyde composition can be employed instead. By following the principles given in the drawing of the switch and crossing, you will be able to wire any layout, no matter how complicated. The plus (+) and minus (−) signs in the drawings indicate the polarity when a D.C. power supply is employed.



Ways to wire switches and crossings to eliminate third rail





Vases made of the material hold water for cut flowers. Left, spinning a small bowl



Above at left, how a piece is started from a solid ball of the mixture. At left, bowl with a simple oil-painted design

## Pottery Mixture Gets Hard Without Being Baked

**M**ANY home workers, like myself, have been inclined to try making pottery but have hesitated because of the cost and inconvenience of having the clay fired. Recently I did some experimenting and was able to produce pieces resembling Indian pottery that have a smooth, velvety finish and are waterproof by using the following self-hardening mixture: four parts Portland cement, three parts ordinary blue clay, obtainable almost everywhere, and two parts powdered cement waterproofing, which may be purchased at any building supply house.

The ingredients are mixed thoroughly, wa-

ter is added, and the whole is kneaded as if it were bread dough. The material is then ready to be formed by hand or spun on a potter's wheel. The hands should be kept wet, and when the material cracks while being worked, it is pressed together and made smooth.

After the finished pieces have dried in the air, smooth the outside with sandpaper and apply any desired design with oil paints thinned with turpentine. Since the material is waterproof, vases and bowls may be used for holding cut flowers.—DICK HUTCHINSON.

## Old Toothbrush Cleans Combs

**ALTHOUGH** many types of comb cleaners have been invented, a discarded toothbrush serves the purpose very well after it has been washed clean and rinsed in an antiseptic solution.—C. NYE.

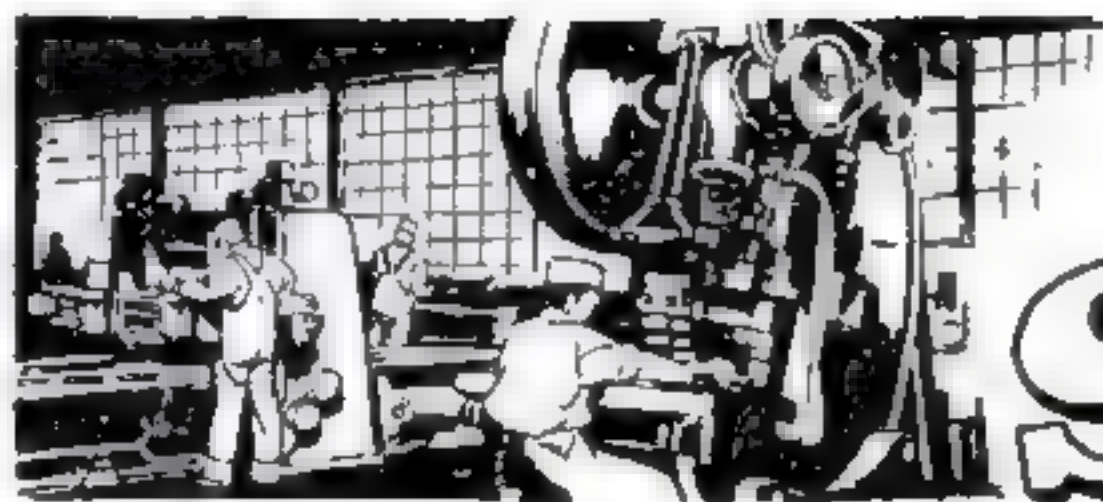
## Now Ready—The Home Workshop Annual Index for 1938

**IF YOU** keep a file of back copies of POPULAR SCIENCE MONTHLY, you should send at once for a copy of the Home Workshop Annual Index for 1938. During the past year nearly 600 pages were devoted to the home workshop and to such hobbies as radio, microscopy, chemistry, and astronomy. The 1938 edition of the Index—just published—lists every item. Get it and you will save yourself hours of searching through old magazines for needed information to help you in your work.

You do not have to fill out a coupon or write a letter. Merely address Popular Science Home Workshop Index, 353 Fourth Avenue, New York, and inclose ten cents together with a large return envelope addressed to yourself. There are still a few copies of the 1937 Index available at the same nominal price of ten cents. Send twenty cents if you wish the Indexes for both years.







# new SHOP IDEAS



## Air Compressor

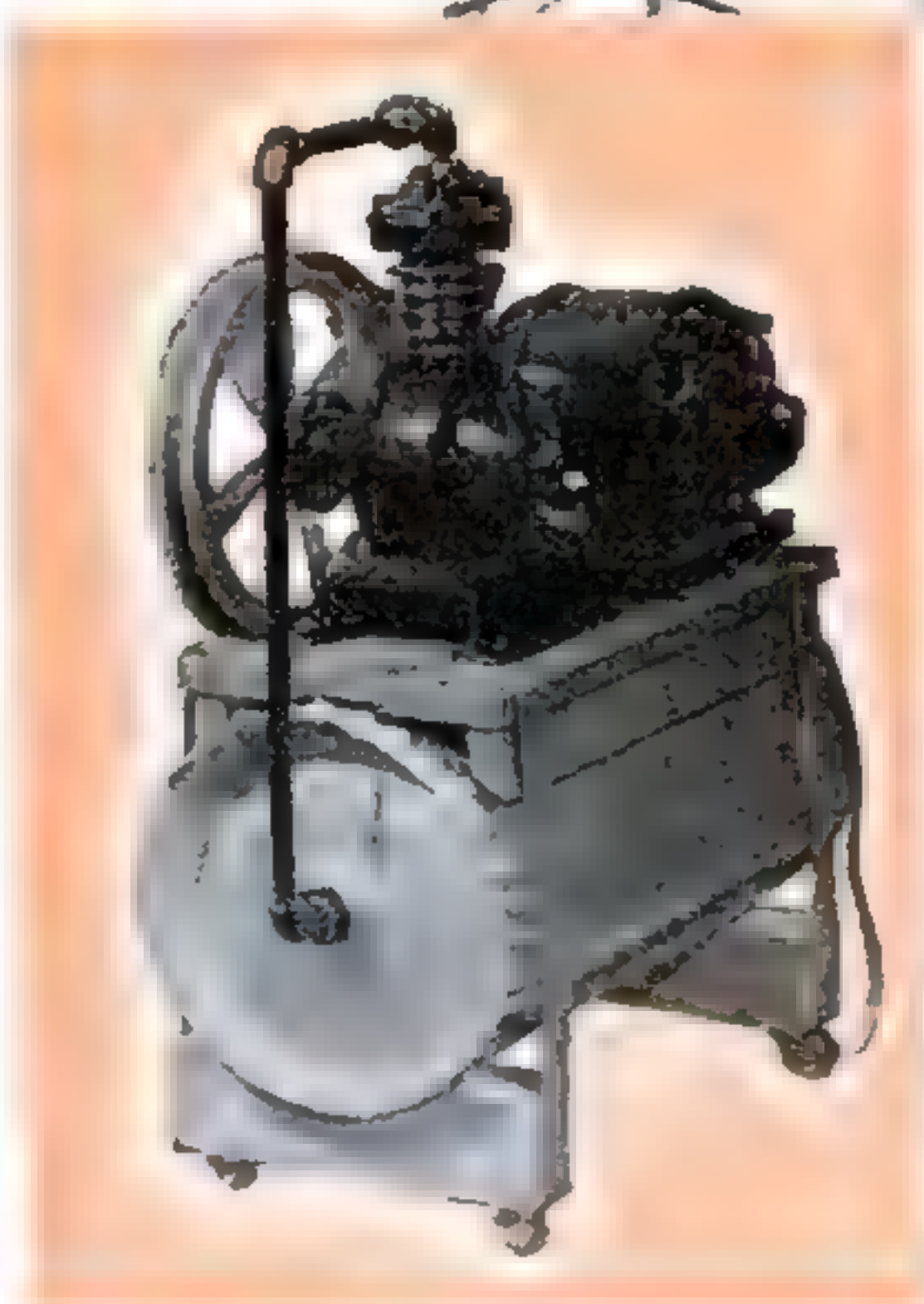
BUILT FROM JUNKED PARTS

By  
HAROLD P.  
STRAND

**J**UNKED materials were used almost entirely in building the efficient air compressor illustrated. Compressor and motor, taken from an obsolete type of electric refrigerator, cost five dollars. An expansion tank that had been used in a hot-water heating system was bought for two dollars from a building wrecker. A plumbing shop supplied a 200-lb. gauge for a dollar and a hand valve for thirty-five cents.

The motor required cleaning and general overhauling as described in previous articles (P. S. M., Nov. '37, p. 98, and Dec. '37, p. 96). All old oil and dirt were removed from the compressor, and the studs were sawed off at the suction and exhaust ports. At the latter, on top of the compressor, the center hole was tapped for  $\frac{1}{4}$ " pipe threads. The pipe was run to the tank as shown, and all other outlets in the tank were plugged except one for the gauge at the side and one at the end for the hand valve. The suction port at the side of the compressor was left open to admit air, and the plug in the base was removed to allow more air to enter by way of the valve on top of the piston.

Although this compressor will pump a pressure far beyond 100 lb., it is not advis-



Assembled for less than \$10, this portable outfit is run by a motor and compressor taken from an obsolete refrigerator

able to exceed that amount unless a new, tested tank is used. If desired, the second outlet in the side of the tank may be used for a safety valve or an automatic pressure switch to control the starting and stopping of the motor. A trap to catch oil or water may also be installed next to the hand valve, although the writer has not found that necessary as yet.

The compressor and motor are painted with black iron enamel, and the tank and lower skids, aluminum.

In case greater air capacity is required, select a two-cylinder compressor with a larger motor in place of the unit shown.

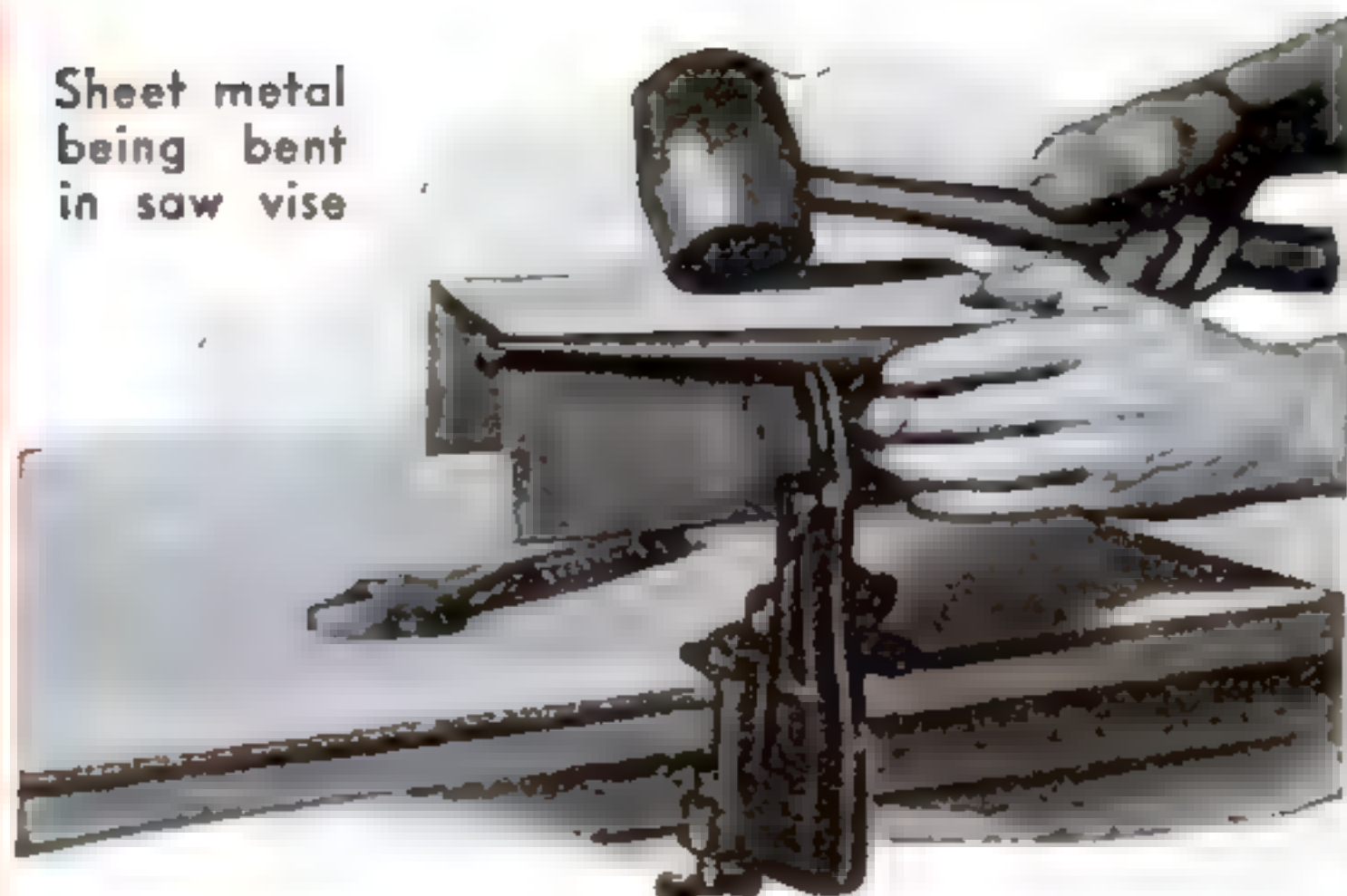




### Handy Tin-Can Glue Pot

FOR preparing hot glue, a glue pot can be improvised as shown from a coffee can or other fairly large can for holding the water and a smaller can that can be suspended inside it by means of a wire. The wire serves as a handle for carrying the inner can with the melted glue and also as a strike wire for wiping any surplus glue neatly and easily off the brush or paddle.—J. J. EDWARDS.

Sheet metal being bent in saw vise



### Light Sheet Metal Bent by Using Saw Vise

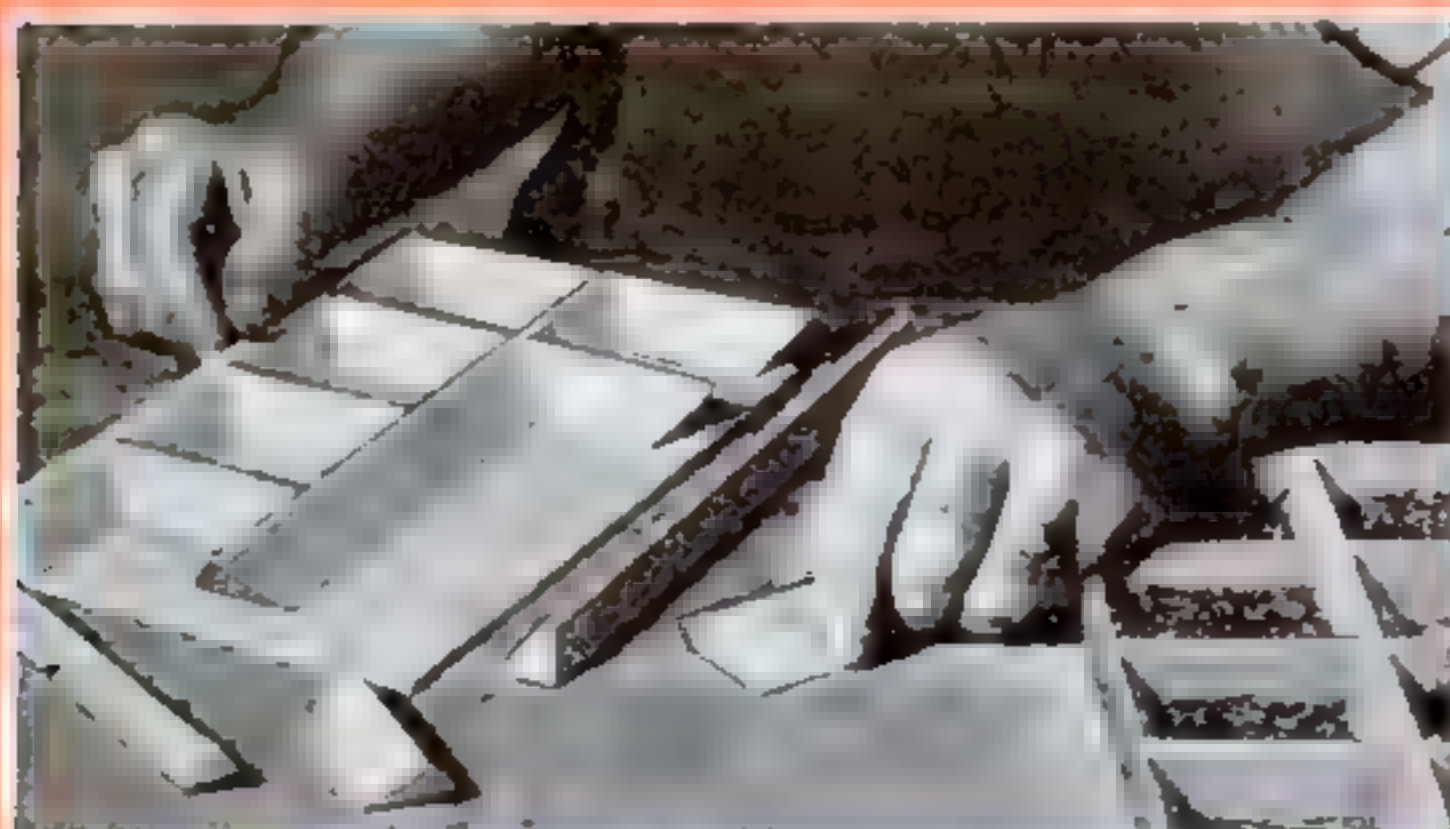
OCCASIONAL jobs of sheet-metal forming may be done with the aid of a saw vise as shown above. The great depth of throat, combined with the comparatively wide clamping surface, makes this type of vise especially suitable. The usual saw vise is sturdy enough to stand up under light work without injury provided reasonable care is used—W. W.

### Driving Small Nails into Plaster

SMALL nails may be driven into plaster with less danger of marring the wall if they are first dipped in hot paraffin.—J.C.W.

### Slanting Partitions Divide Drawers for Shop Use

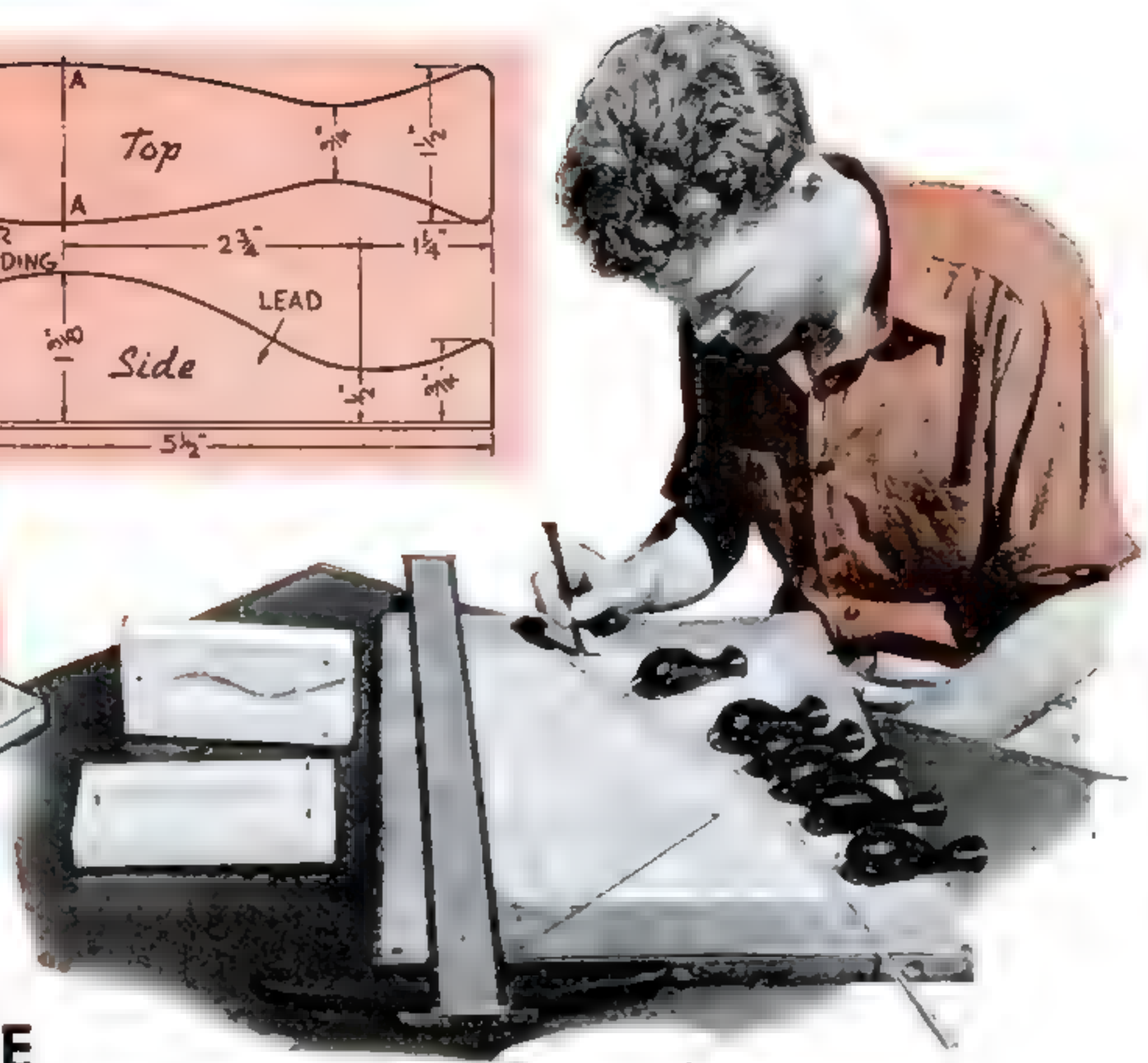
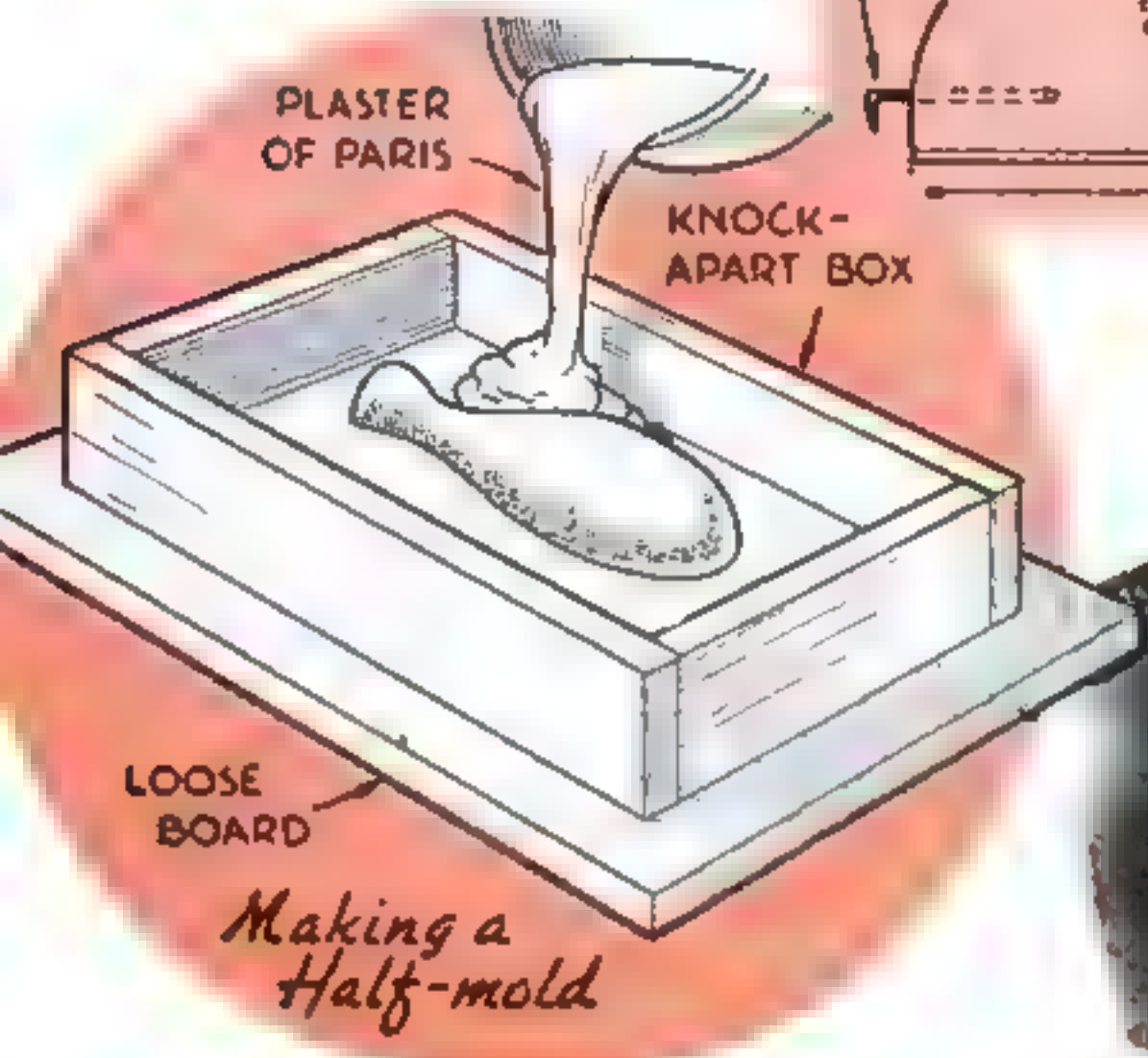
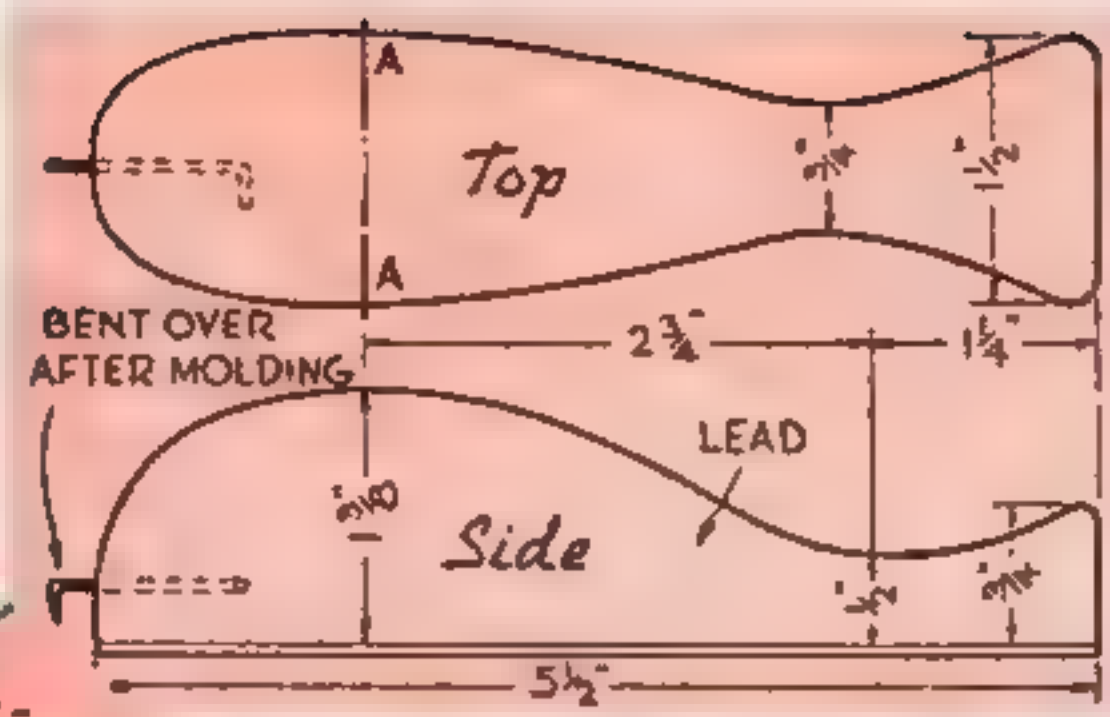
SHALLOW sectional drawers for shop use are more convenient to use if the partitions and sides are made with triangular pieces so the sections will have sloping sides. Drawers with long, narrow sections can be made with the sides of the sections sloping and the ends straight as at the right, but where the drawers are to hold small nails, screws, and the like, all four sides should be sloped as shown below to avoid having to pick anything out of awkward corners.—M.T.



Drawers with narrow sections are divided as shown above, other drawers as at the left

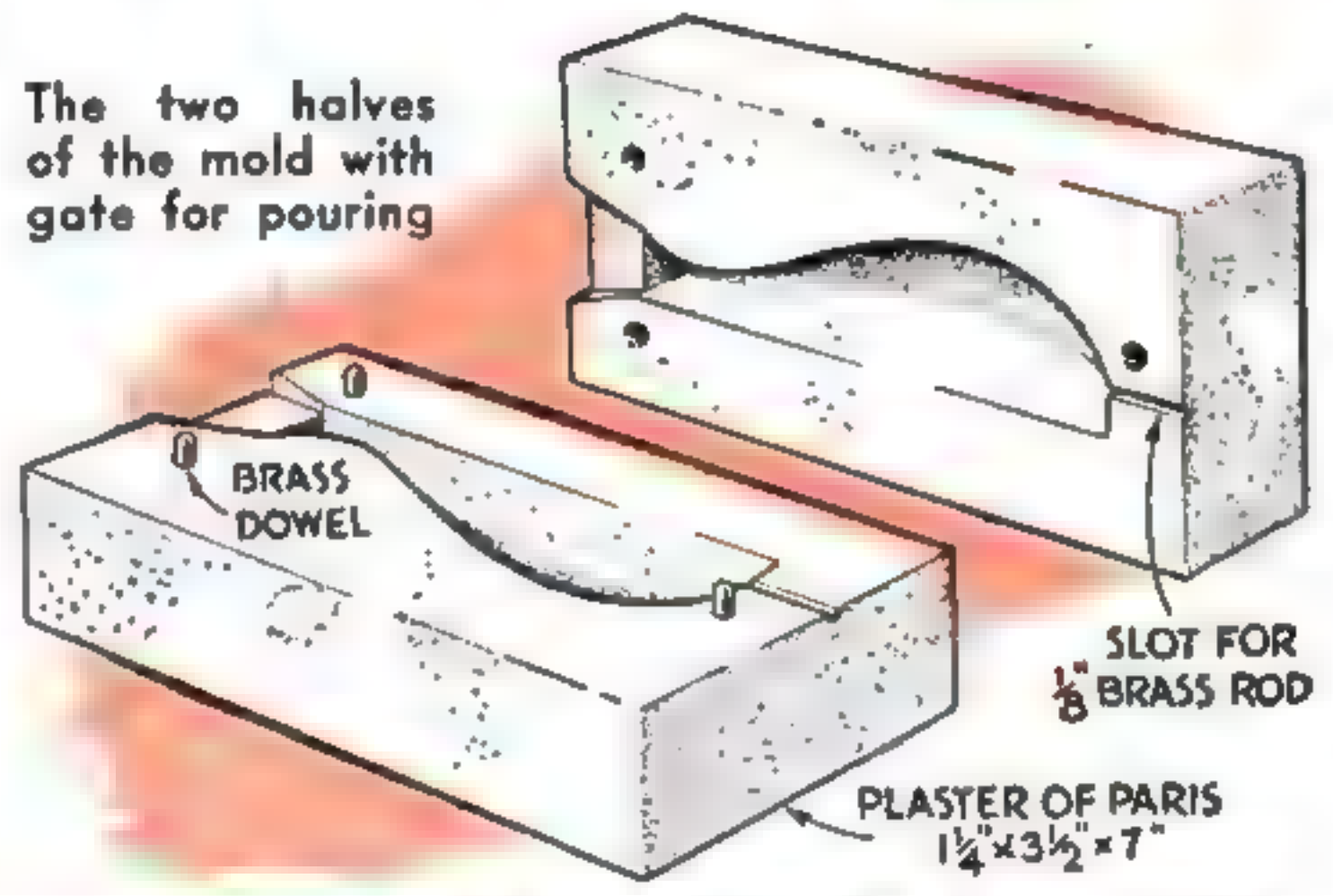


Right, shape of completed "duck." Below, pouring the plaster over one half of the clay pattern



# HOW TO MAKE Lead 'Ducks' for Draftsmen

LEAD weights, called "ducks" or "whales" by draftsmen, are indispensable for holding a spline or curved ruler, but expensive to buy. To make a set, prepare a clay model and divide it down the middle (or whittle from pine). Oil the pattern, lay one side on a board, place an open box around, and pour in plaster. Make the other half mold similarly, with brass dowels for registering. When thoroughly dry, assemble the mold, set the brass hook in place, and pour in lead. Smooth up, paint black, and cement felt on bottom.



## V-Notch in Vise Useful for Filing



WHEN the end of small rods are to be rounded with a file, they can be conveniently held stationary by placing them in a V-notch, cut or filed in the right-hand edge of the front vise jaw. As the rod is filed round, it is rotated with the fingers, thus eliminating all tiresome clamping and unclamping of the work in the vise necessary with the ordinary method.



## Drilling Thin Metal Without Distortion

UNLESS clamped between blocks of wood, thin metal is difficult to drill. It can be done, however, by drilling until almost through, then turning the work over and filing off the protruding hump left by the drill.

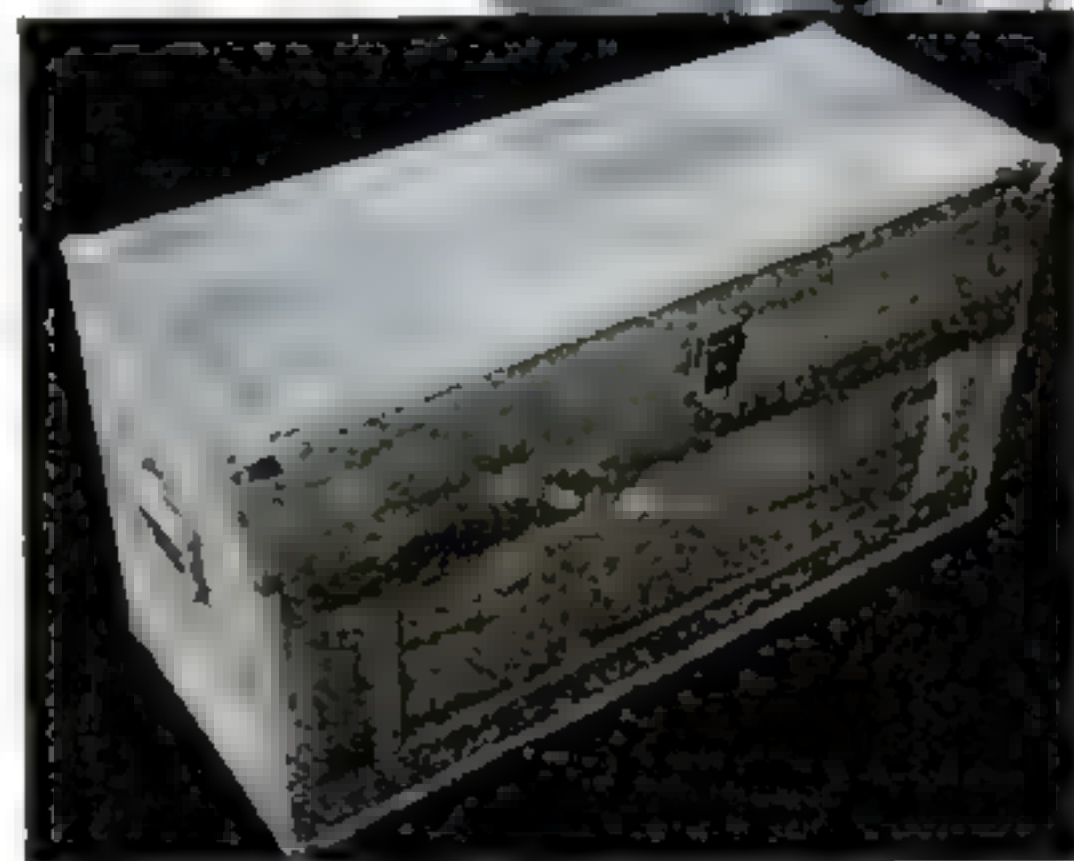


# HANDSOME Sycamore Chest

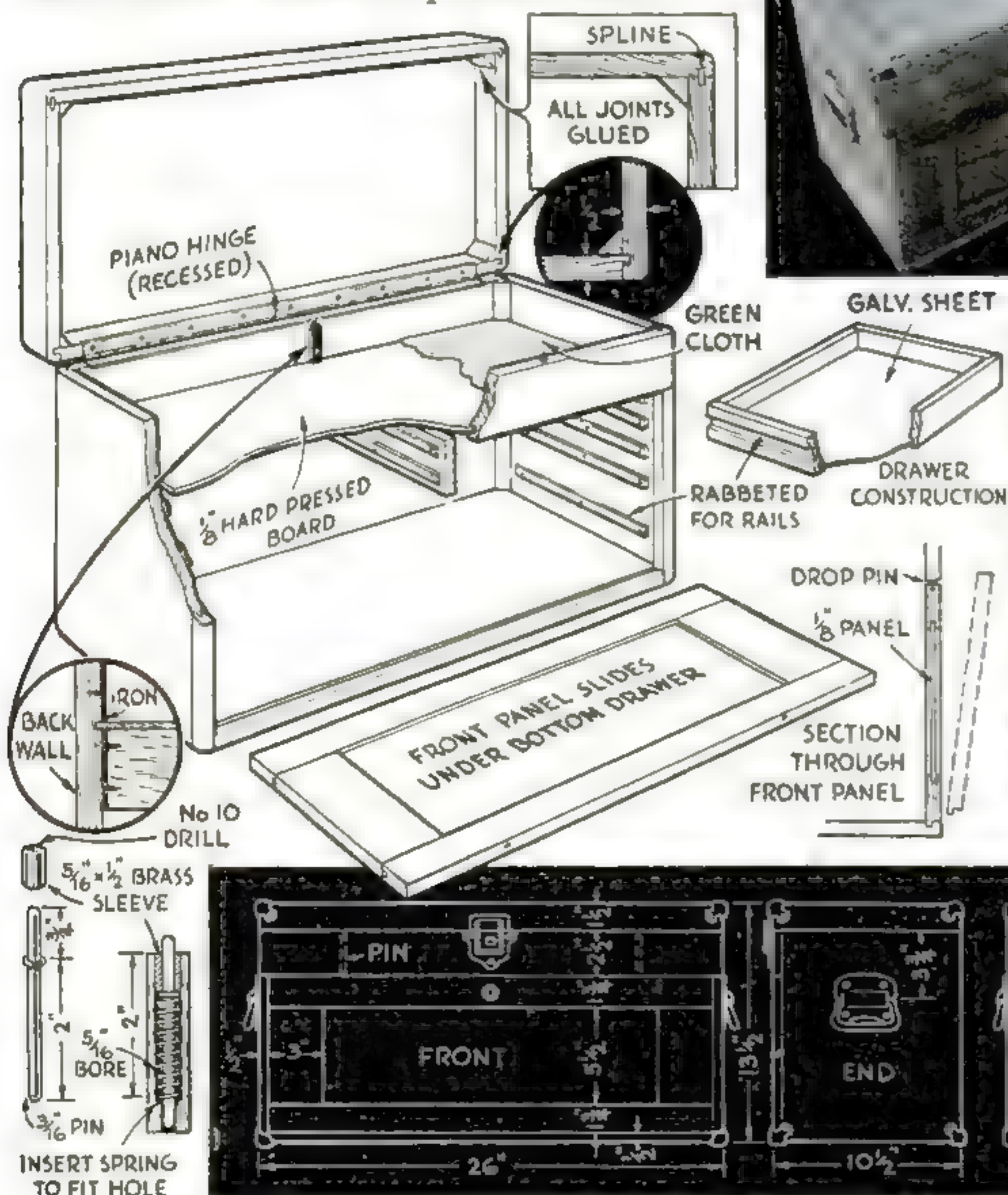
HOLDS MACHINIST'S  
TOOLS

**A**MATEUR and professional machinists who want something special in the way of a chest to hold their tools can hardly do better than copy this exceptionally fine design by Lester Hall, of Pasadena, Calif. The principal parts are made of  $\frac{1}{2}$ " quarter-sawn sycamore, but maple, mahogany, or oak would also be suitable. Spline, tongue-and-groove, and rabbeted joints are variously used, as indicated, and held with waterproof casein glue.

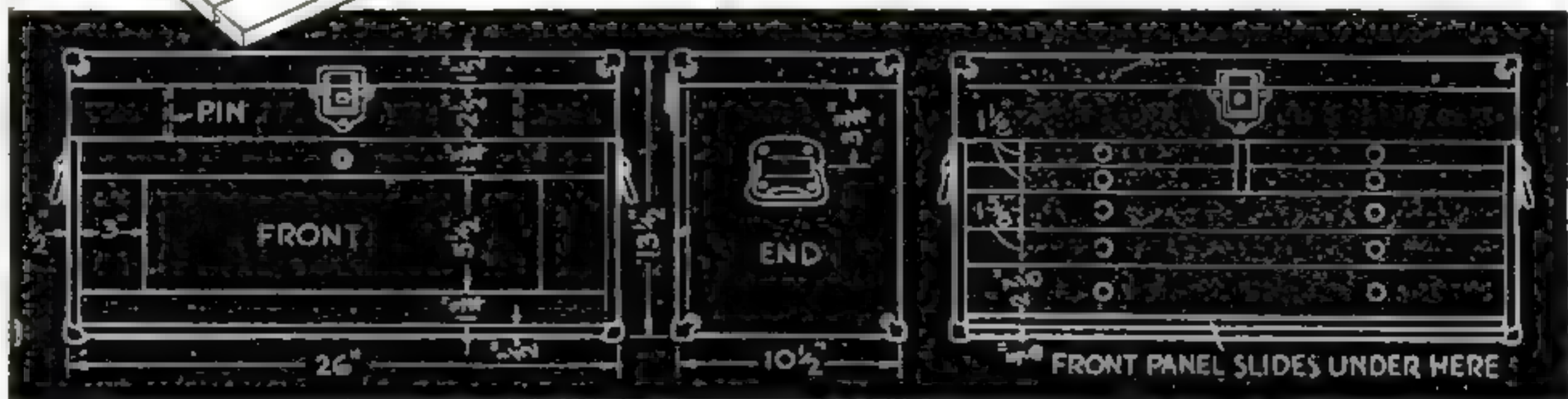
Note that the front panel lifts out entirely and can be slid under the bottom drawer. When the panel is set in



Raising the lid unlocks the panel in front, which may then be lifted out and slid under the bottom drawer.



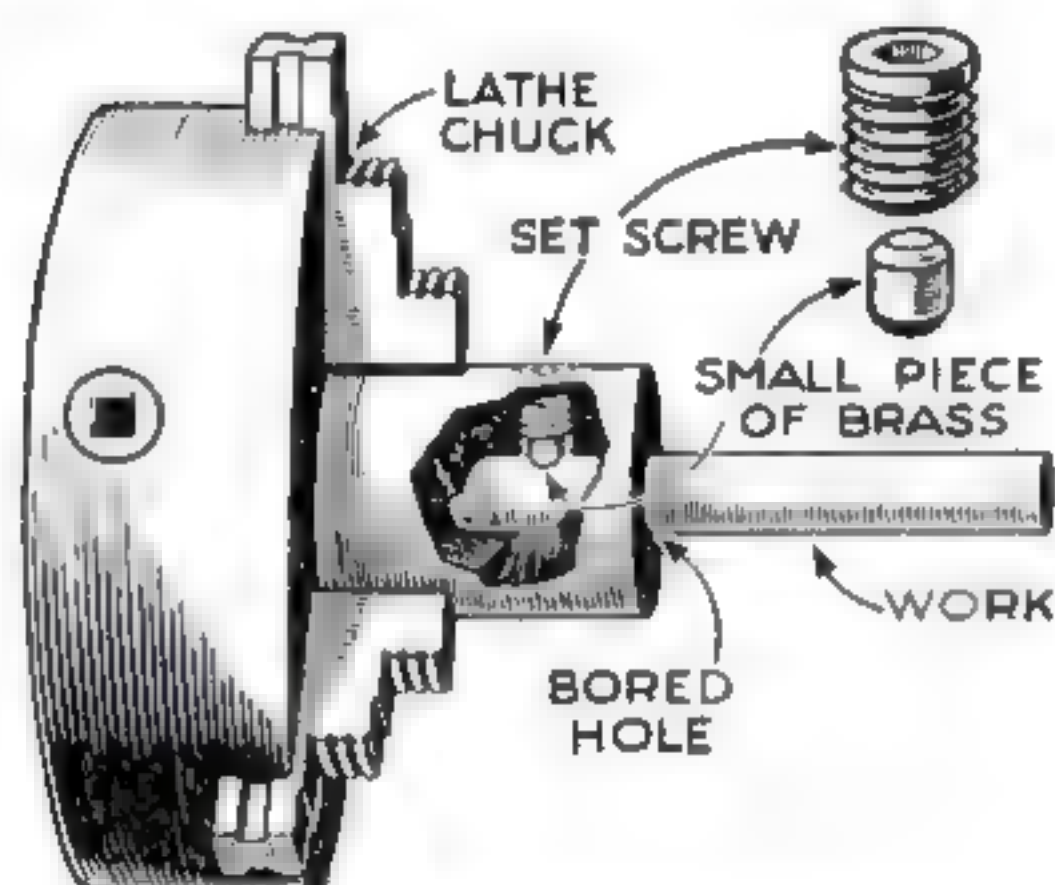
place to close the drawer compartment and the lid is shut down, two pins in the top rail are forced into holes in the top edge of the panel, locking it securely. As soon as the lid is raised, springs force the pins up out of the panel so it may be lifted out. Each drawer bottom is covered with green cloth so the various precision tools rest on a soft surface. Metal corners add to the attractiveness of the chest.—HI SIBLEY.





# Bumper Jack Regulates Head of Drill Press

**A**N ORDINARY two-dollar bumper jack of the type consisting of a jackscrew, base, and ratchet wrench, makes a simple but effective screw adjustment for a drill-press head. The head may be raised or lowered with the touch of a finger, and all danger that the head will suddenly slip down the column is eliminated. It is necessary only to cut a V-shaped notch in the base plate so that the jack-screw may be set fairly close and parallel to the drill-press column. The lifting nut of the jack will engage the motor base plate of most small drill presses without alteration, and may be bolted to the base plate or left free. If the drill press is equipped with a short belt, it may be necessary to substitute a longer belt.—HENRY E. BELDEN.



## Turning Accurately with Worn Chuck

VARIOUS ways to do precision turning with a worn lathe chuck have been described, but one of the best is as follows: Near the end of a piece of stock about 1" greater in diameter than the work to be turned, tap a hole halfway through for a set screw. Tighten this piece in the lathe chuck and bore a hole in it that is a slide fit for the work. Draw the work through this hole for the required length and tighten the set screw. A short piece of brass may be placed between set screw and work.—J.G.

## Old Working Glove Holds Chisels

MANY carpenters keep their wood chisels and gouges in a roll of heavy canvas, with individual pockets for each tool. Those who have only occasional use for such tools, such as farmers, can give them equal protection by storing them, with cutting edge down, in the fingers of an old, oily working glove as illustrated at the right.—NORVAL WRIGHT.

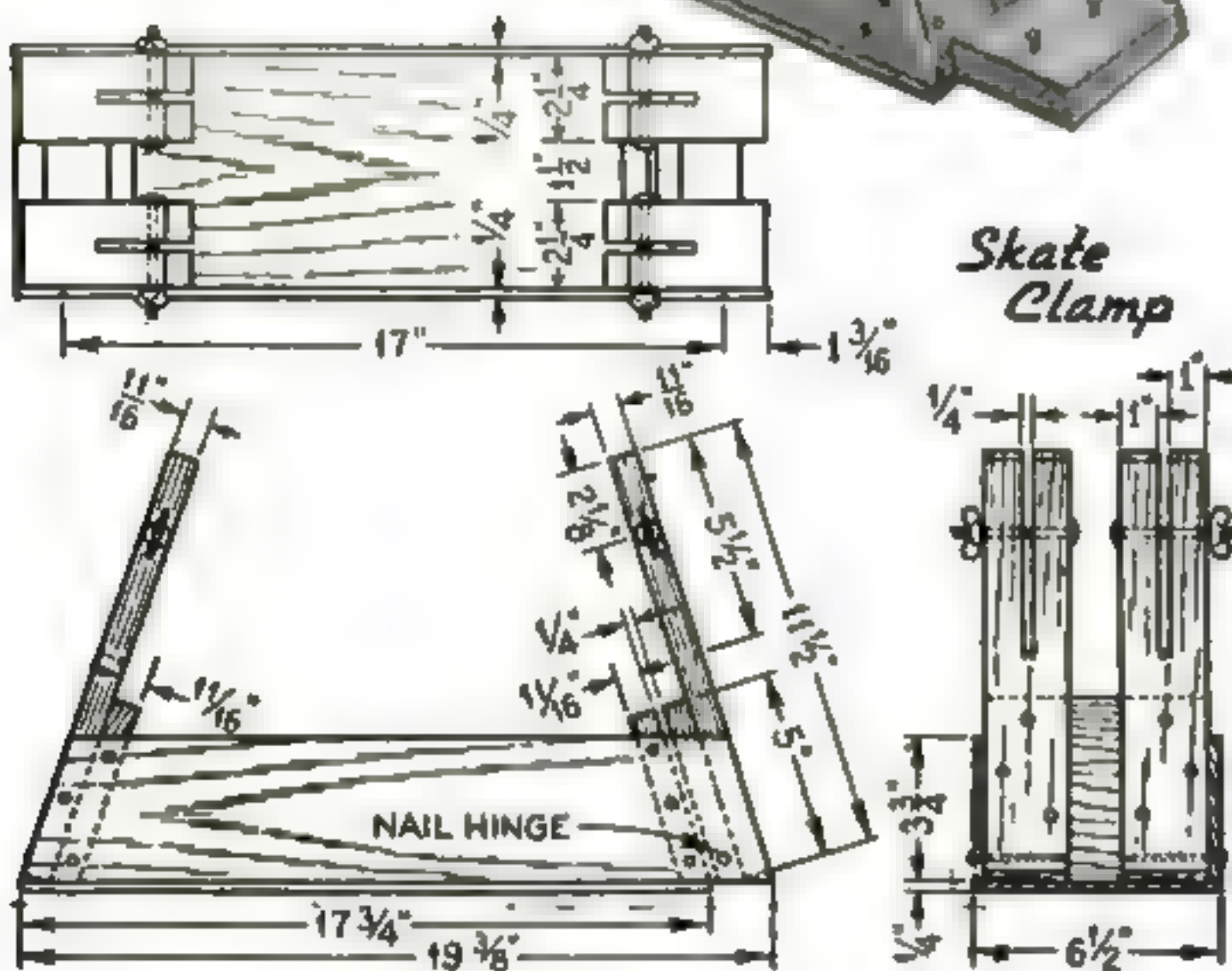
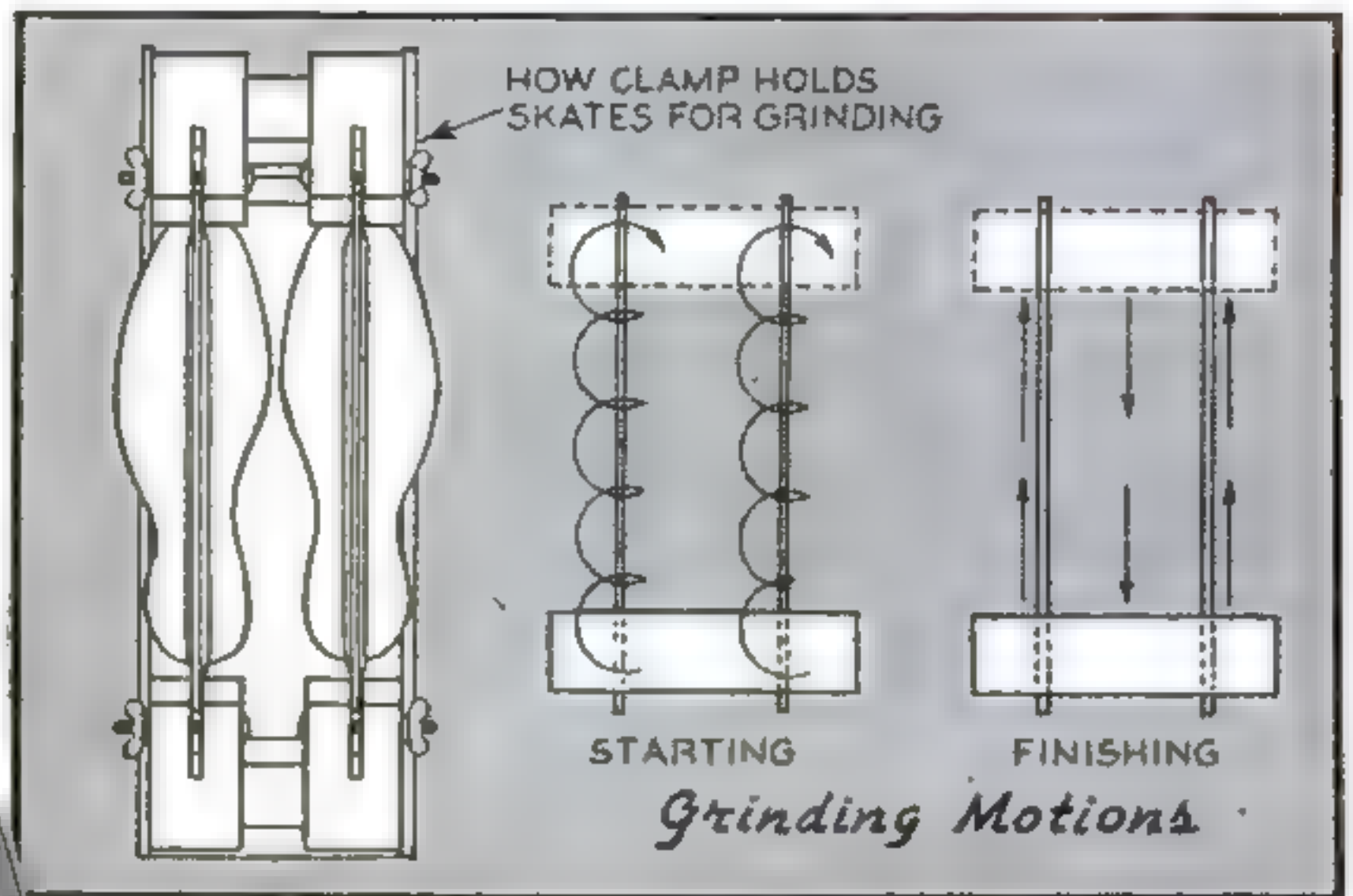


## Doing Close Work with Flash Light

WHILE doing close work with a flash light, it sometimes is necessary to use both hands. If there is nothing nearby to rest the flash light on, a simple expedient is to insert it under your shirt collar.—WILLIAM SWALLOW.



# Sharpening Skates



## LIST OF MATERIALS

| No. Pc.  | Description | T.    | W.    | L.     |
|--|-------------|-------|-------|--------|
| 4  | Clamps      | 11/16 | 2 1/4 | 11 1/2 |
| 2  | Ends        | 11/16 | 5     | 6      |
| 1  | End brace   | 11/16 | 4 1/4 | 6      |
| 2  | Sides       | 1/4   | 3 1/4 | 19 1/2 |
| 1  | Bottom      | 1/4   | 6 1/2 | 17 1/4 |
| 4 carriage bolts 2 1/4" by 1/4" with washers and wing nuts |             |       |       |        |

Note: All dimensions are given in inches.

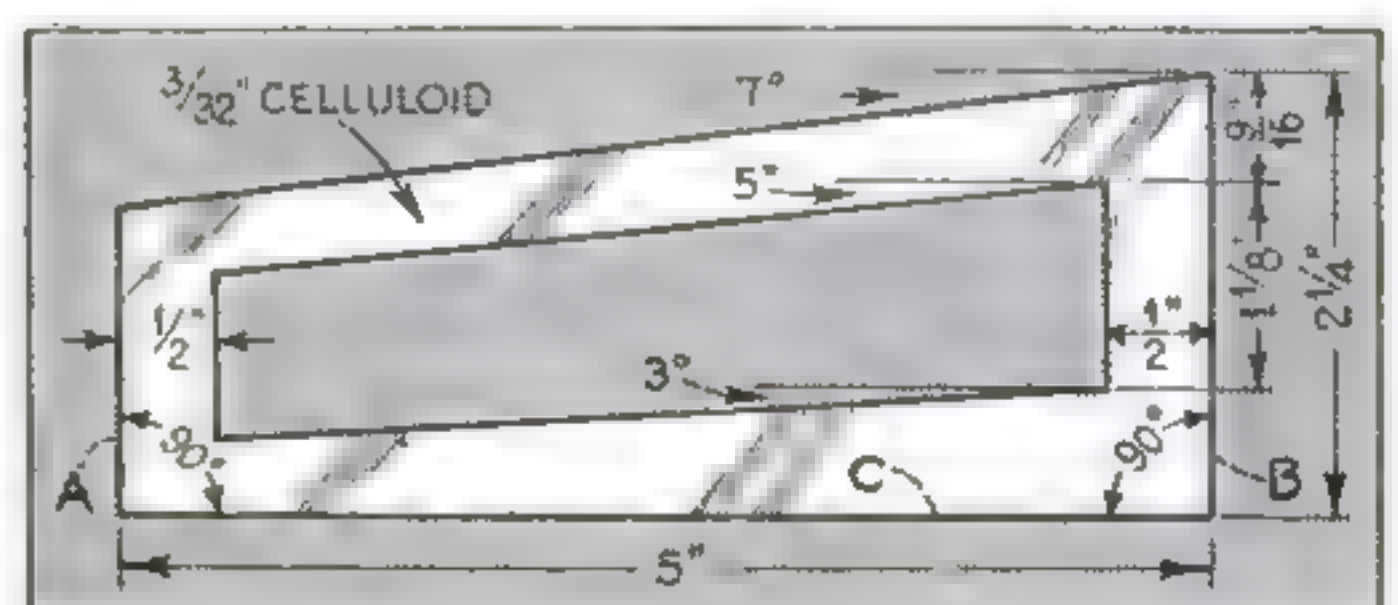
**B**Y USING a clamp made as shown, you can sharpen skates at home so that they have keen and perfectly true edges. The necessary wood for the clamp may be obtained from a discarded orange crate.

To prepare skates for sharpening, clamp one skate tightly in place, then line up the second skate as closely as possible and fasten it. Take your oilstone and draw one edge lightly across both blades. If scratches appear on the outside edge of the second skate, the skate is too low and should be raised until scratches appear all across the blade. If scratches appear the first time on the inside of the blade of the second skate, it is too high and should be lowered until repeated tests show scratches all across.

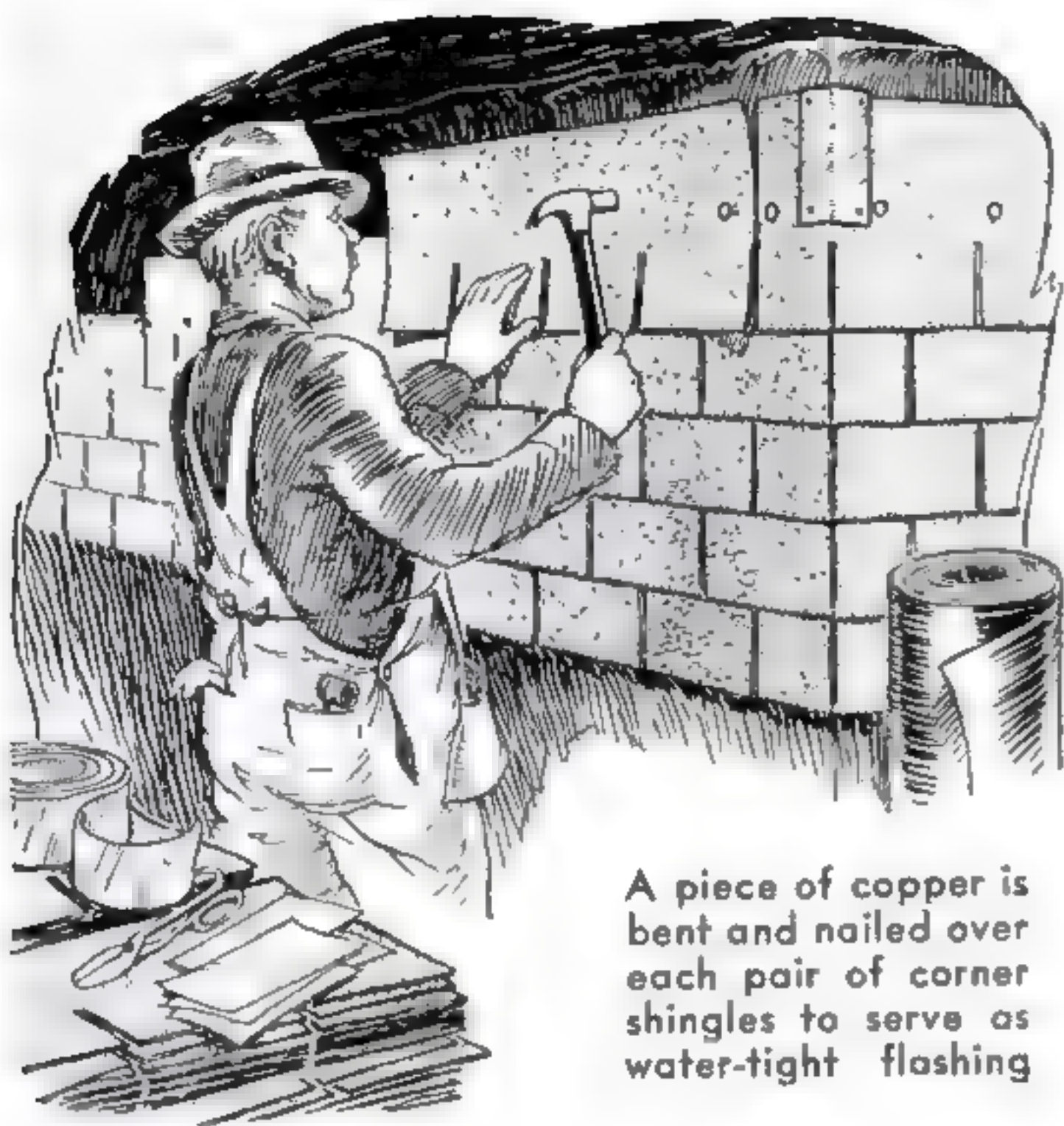
When the skates are properly aligned, a light film of oil is spread over the cutting surface of the oilstone and the grinding is done with a circular motion. As soon as a feather edge appears along the entire length of the blades, finish the grinding with a straight stroke from heel to toe. This will remove the cross scratches and give the blades a smooth, honed surface with sharp edges.—LAWRENCE SUESS.

## Celluloid Tool Saves Time in Drawing Draft Lines

**C**UT from celluloid, the tool illustrated at the right will be found to save much time in drawing the so-called "draft" lines on castings and forgings. The angles indicated are the drafts generally used. Since the ends A and B are at right angles to side C, the tool may also be used conveniently for drawing horizontal and vertical lines like a regular triangle.—PETER F. ROSSMANN.







A piece of copper is bent and nailed over each pair of corner shingles to serve as water-tight flashing

## Water-tight Corner Joint for Asphalt Shingles

WHEN amateurs attempt to apply asphalt shingles to the sides of a house, they are sometimes puzzled as to how the corners may be made water-tight. This is done by placing a small piece of copper over each pair of corner shingles as shown. If this copper flashing is long enough to lap over the piece used under the preceding layer, there is little or no possibility of water seeping in along the edge. A single long strip is sometimes bent and applied over the corner before any shingles are laid, but is not as satisfactory.

## Bottle Labels Coated with Wax

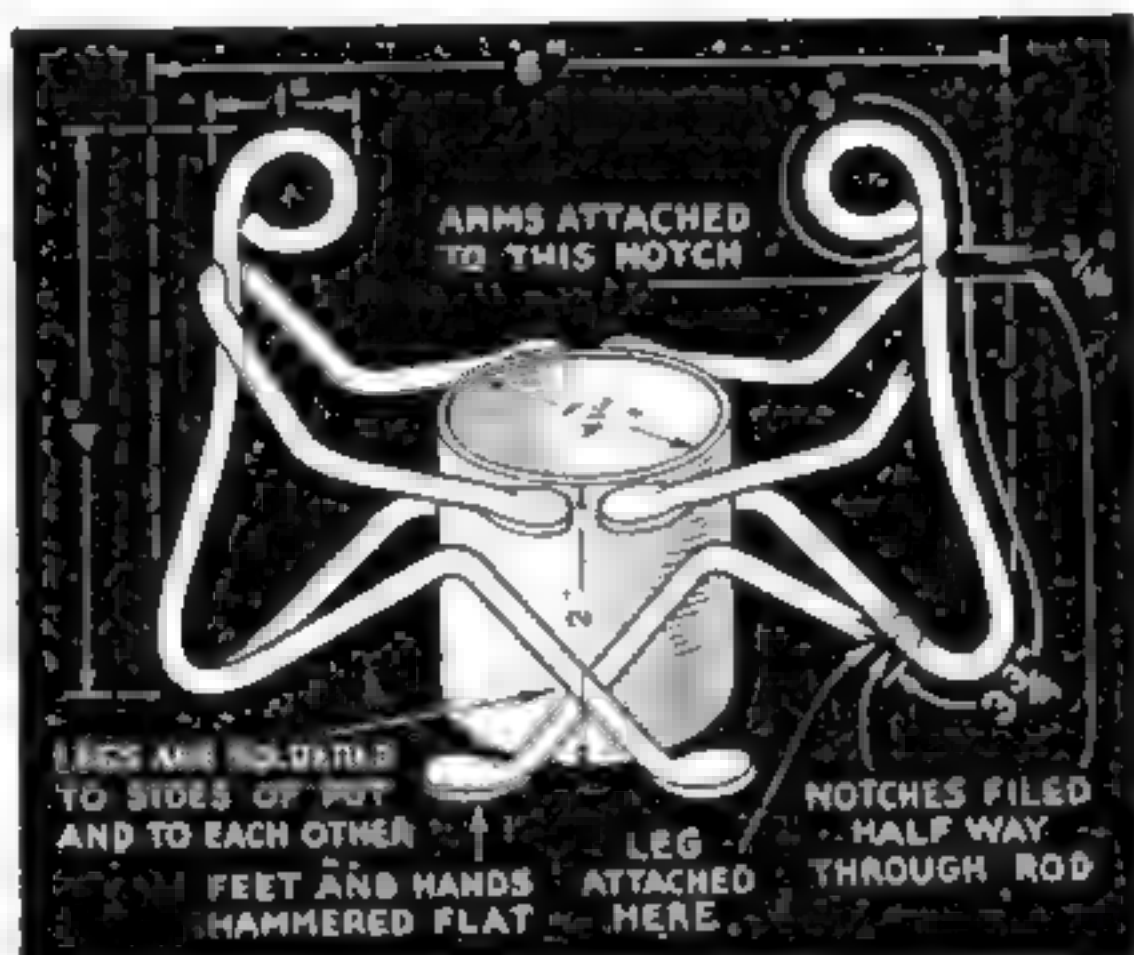
HOME chemists will find the labels of their reagent bottles will last much longer and remain legible if rubbed lightly with a common wax candle.—LOUIS FELDMAN.

## Wire Cannibals Guard Pot of Cigarettes

ONLY cigarettes are contained in this miniature stewpot, but two cannibals guard it as though their lunch was within. The following materials are required: 22-gauge copper 2" by 6" for pot, disk of copper 1 3/4" in diameter for bottom of pot, 3/16" brass or copper rod 43" long (4" for leg, 11" for head, body, and other leg, and 6 1/2" for arms of each cannibal).

Brass rod, which was used for the original, is rather hard when bought and has to be annealed before bending. Hold it with tongs or pliers over a gas-stove burner or in hot coals until it turns a dull red; then cool under a faucet. A small vise and a mandrel, or an anvil, is needed to bend and shape the rods properly.

First bend the head, body, and one leg to shape. When this is done, make a similar piece for the second figure. Bend the other parts, file notches as indicated, and solder together. To make the pot, roll the piece of copper around the disk and hold in place for soldering with two pieces of soft iron wire. Solder the seam, remove the wire, clean the cannibals and pot with fine emery cloth, and then solder the figures to the pot. Apply a coat of lacquer if you want the figures to remain as bright as when you polished them.—FRANKLIN H. GOTTSHALL.



The pot is made of copper, the figures from 3/16" brass rod. All parts are soldered together

The two photographs below illustrate how the brass rod is bent over the horn of an anvil and how the soldering is done

Below, the finished holder. The stewpot will hold an entire pack of cigarettes





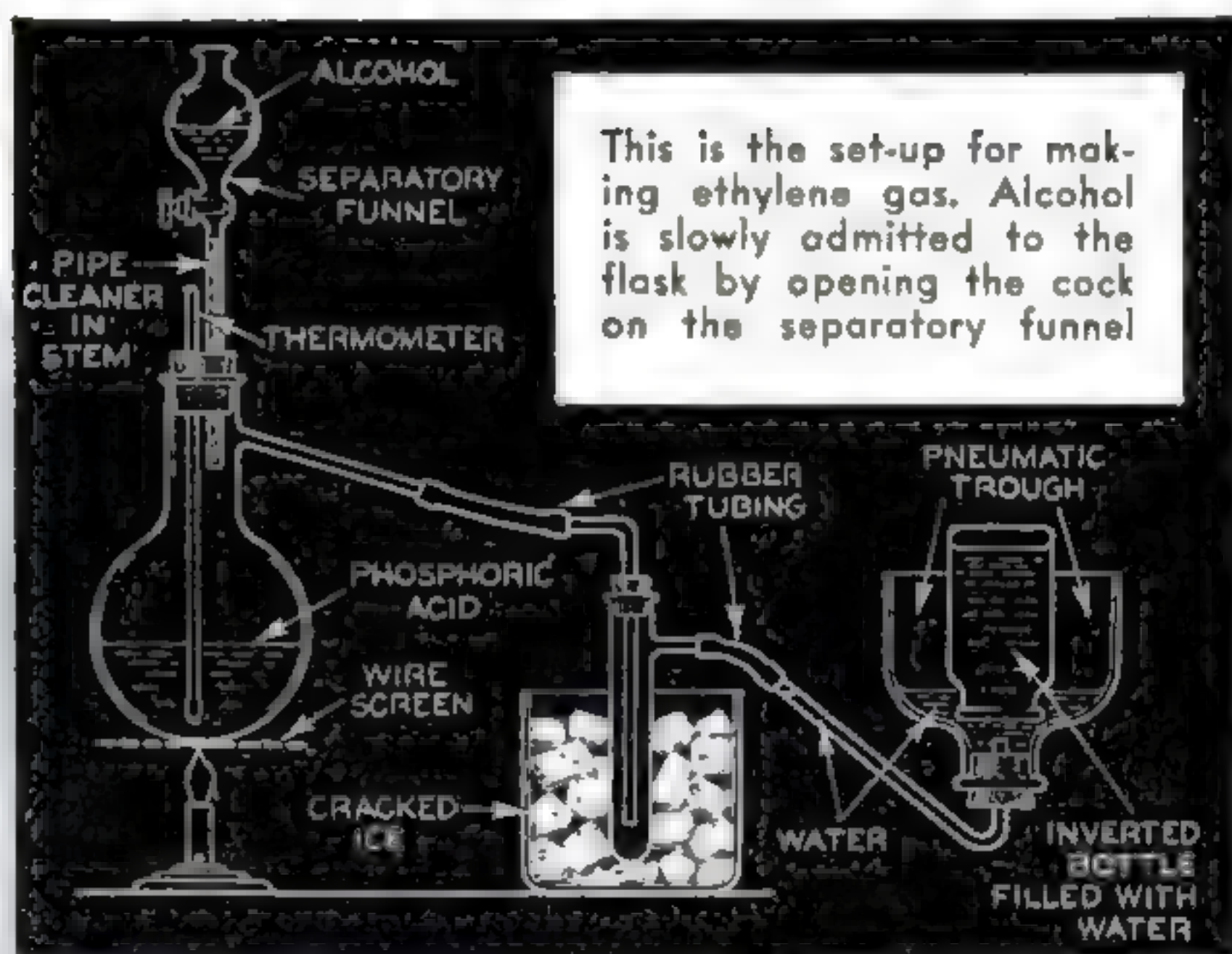
# Gas Chemistry for

**P**ROBABLY one of your first adventures in chemistry was to make illuminating gas. Heating a little coal in a test tube, you found you could ignite the gas that distilled from it. Although you may not have known it at the time, you produced some ethylene gas in this experiment; for illuminating gas consists of hydrogen, carbon monoxide, and also various "hydrocarbons," or hydrogen-carbon compounds, including ethylene. In fact, it is the combustion of the ethylene that gives the luminous yellow color

to the flame of an old-fashioned gas jet.

Ethylene has more modern practical uses. Bananas and citrus fruits are now ripened artificially, by exposure to air containing as little as one tenth of a percent of ethylene. Mixed with seven to twelve percent of oxygen, ethylene makes a valuable anesthetic.

You can easily prepare this interesting gas and test some of its properties in your own home laboratory. The simplest way is to heat alcohol with sirupy phosphoric acid. A sort of chemical dehydration occurs, in which a molecule of water is removed from a molecule of alcohol. This has no relation, of course, to the kind of dehydration that takes place when damp clothes dry in the sun. In the chemical process, the alcohol molecules are actually disrupted, and ethylene gas remains as the product of the reaction.





# Home Experimenters

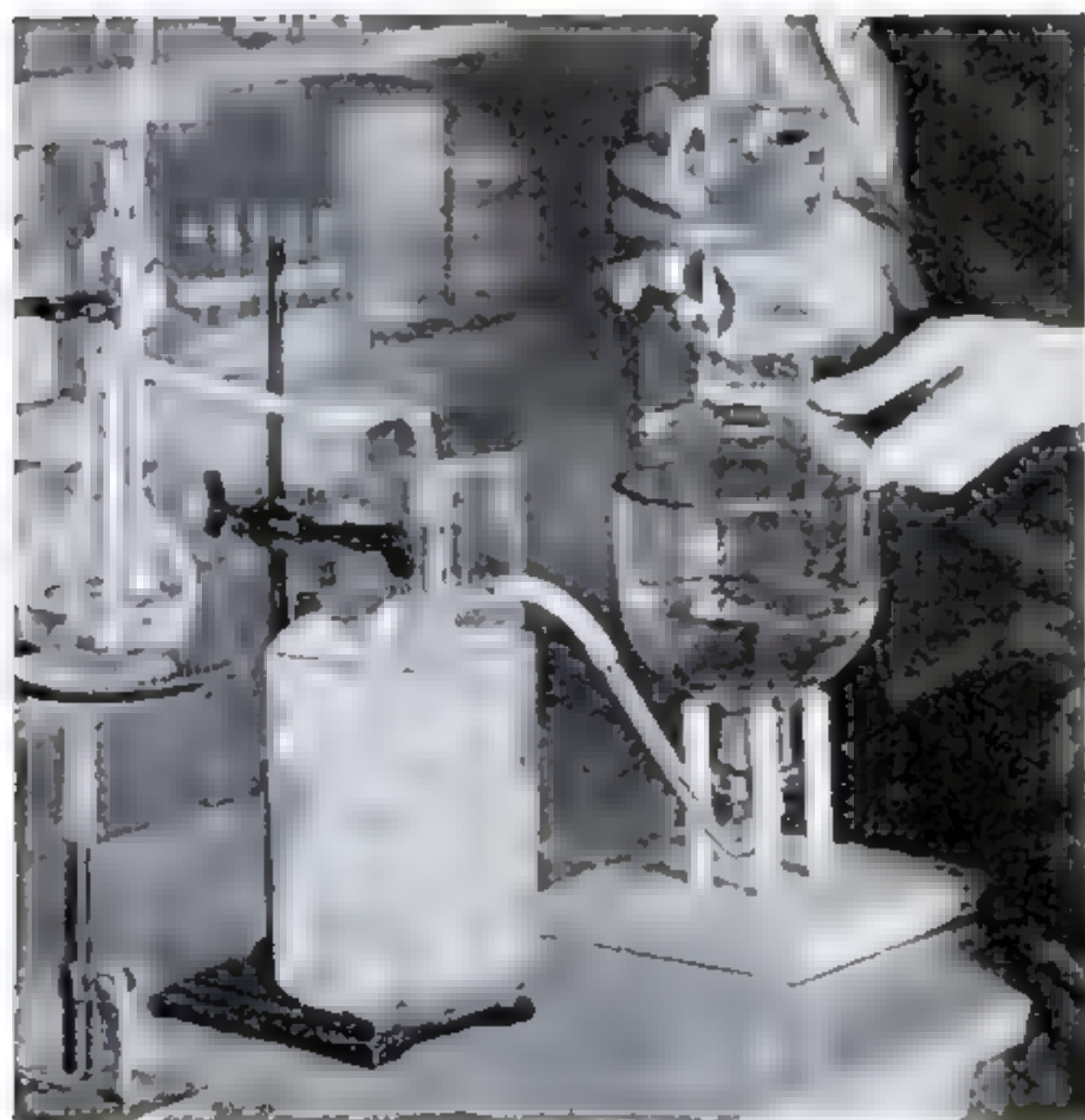
## IT'S EASY TO GENERATE ETHYLENE AND TEST ITS REMARKABLE PROPERTIES

By  
**RAYMOND B. WAILES**

Ethyl or grain alcohol serves as the raw material for making ethylene. While the denaturants in radiator and rubbing alcohol might not happen to interfere in this experiment, it is preferable to use ordinary grain alcohol, which now may readily be purchased at a moderate price.

For the gas generator, use a distilling flask with a capacity of 100 to 200 cubic centimeters. Fit the flask with a cork carrying a separatory funnel and a thermometer which should fit tightly in their holes. To insure this, bore the holes a little too small—using a regular laboratory cork borer—and then enlarge them to just the right size with a rat-tail file. This is better than trying to seal leaks through over-size holes with a plastic or tape.

Connect the side arm of the distilling flask to the mouth of a side-necked test tube, which is placed in a jar of cracked



To collect ethylene prepared as shown on the opposite page, an inverted bottle full of water is lowered carefully into the pneumatic trough



In this mystifying experiment, chlorine gas makes a drawing vanish from a piece of paper and another one appear

ice or snow to keep it cool. The connecting piece of glass tubing should extend nearly to the bottom of the test tube, as shown in the diagram. From the side outlet of the test tube, a piece of tubing should lead to a "pneumatic trough," or device for collecting gas under water. Any kind of pneumatic trough will serve; the convenient form shown in the diagram is made from a large glass bottle with its bottom cut off, as described in one of the early articles in this series (P.S.M., May '35, p. 46).

Now place forty to fifty cubic centimeters, or about one and a half fluid ounces, of sirupy phosphoric acid in the distilling flask. Thrust a pipe cleaner (such as smokers use) into the stem of the separatory funnel, so that it fills the whole stem. Then fit the cork in place and adjust the thermometer so that the mercury bulb dips into the liquid. Close the stopcock of the funnel, and fill it with about fifty cubic centimeters of grain alcohol.

Heat the sirupy phosphoric acid in the flask. When the temperature has reached, say, 200 or 220 degrees centigrade (400 or 420 degrees, roughly, if you are using a Fahrenheit thermometer), open the stopcock of the funnel and admit alcohol to the flask drop by drop.

As the alcohol strikes the hot phosphoric acid, you will observe a brisk evolution of ethylene gas. The pipe cleaner prevents the funnel stem from filling with alcohol and then emptying into the flask in a sudden stream, which would generate ethylene gas so rapidly as to cause an undue rise of pressure in the apparatus.

From the distilling flask, the ethylene gas





Chlorine gas bleaches a photographic print by turning the black particles of silver to silver chloride



With this simple apparatus, you can deposit a coating of metallic copper on the bowl of a clay pipe

passes to the chilled, side-necked test tube. This "ice trap" condenses any impurities, such as water and alcohol vapors. The purified ethylene then goes to the pneumatic trough to be collected in bottles. At first the ethylene will be greatly diluted with air from the apparatus, but the air will be swept out and richer samples of ethylene will be delivered as you continue to add alcohol to the acid. Several bottles of the gas should now be collected for your tests.

To do this, fill a wide-mouthed bottle with

water and invert it in the trough, so that its mouth will be under water and above the gas delivery tube. Covering the bottle with a watch glass will keep it from spilling while you set it in place. When it is full of ethylene gas, remove it and cover it temporarily with a watch glass or square of cardboard to await your use.

To show that ethylene is a combustible gas, remove the temporary cover of one of the bottles and insert a flaming string or broom straw. The gas will burn brilliantly. Like other combustible gases, it forms an explosive mixture with oxygen or air. Therefore this burning experiment should always be performed in a bottle with a wide mouth, which will provide for the sudden expansion in case a considerable amount of air is mixed with the ethylene.

Two parts of carbon and four parts of hydrogen go into the ethylene molecule. You might suspect that one of its products of combustion would be carbon dioxide, and you can easily prove that this is so. Add some clear, filtered limewater to the bottle in which you have just burned ethylene gas. Close the bottle and shake it. The carbon dioxide will react with the limewater to form white calcium carbonate, or precipitated chalk. Water is another of the products formed when ethylene burns to completion; and soot, or free carbon, may result from imperfect combustion.

A chemist would call ethylene gas a "reducing agent"; in other words, it seeks oxygen with vigor. To show this, mix several drops of a weak (rose-colored) solution of potassium permanganate with an equal amount of dilute sulphuric acid. Pour the resulting solution into a bottleful of ethylene gas. The permanganate loses its rosy tint, being reduced by the ethylene to a colorless manganese compound.

Strong sulphuric acid absorbs ethylene gas, forming an organic compound called ethyl sulphuric acid. You can observe this absorption by fitting a bottle of ethylene gas with a two-hole stopper, carrying a separatory funnel and a bent glass tube that dips into a beakerful of water. If you admit several cubic centimeters of strong sulphuric acid through the separatory funnel, the acid will absorb some of the gas and create a partial vacuum, drawing water from the beaker up the glass tube and into the bottle. The same experiment may be performed with illuminating gas, which, as already noted, contains ethylene.

When a mixture of ethylene and chlorine is ignited, the gases react with each other to form hydrochloric acid and carbon. To see this reaction, collect about a third of a bottle of ethylene gas. Then thrust a rubber tube from a generator of chlorine gas under the partially filled bottle, while it is still in the pneumatic trough, and fill the rest with chlo-



rine. Remove the bottle, capping it momentarily, and then thrust a lighted taper into it. The mixture of gases will burn with a yellowish-colored flame. You will notice the formation of soot and the acrid odor of hydrochloric acid, the products of the reaction.

Where chlorine gas is called for in home-laboratory experiments, you may recall, previous articles of this series have advised making the tests outdoors or under a laboratory hood that will remove the noxious chlorine fumes. The ethylene-and-chlorine experiment and other interesting tests with chlorine, however, may be performed indoors without special precautions if you generate the chlorine in the following handy way. Only a small quantity of chlorine gas is produced, and this is immediately used in the experiment, so that there is little or no surplus of it to produce troublesome fumes.

Simply place in a side-necked test tube a few grams of cupric (copper) chloride; as much as ten to fifteen grams (two to three teaspoonfuls) of the powdered greenish-blue crystals may be used for the ethylene-and-chlorine experiment, while smaller quantities will suffice for other experiments with chlorine. Cork the tube, and heat it with an alcohol lamp or a Bunsen burner. The heat will

Ethylene gas burns brightly when a lighted taper is thrust into a jar containing the gas



## Window Fixture Makes Disappearing Ring Stand



By adjusting the set screw, the supporting rod may be set at any height, or withdrawn

A DISAPPEARING laboratory support, or ring-stand rod, will make a particularly convenient fitting for your chemical workbench or table. In use,

it can't be tipped over. When you are through with it, it slides out of the way to clear the full working space of the bench for other experiments.

To make it, obtain a casement-window adjuster of the sort shown in the sketch, which may be bought for as little as a quarter. Knock out the hinge pin and discard all parts but the knurled set screw with its drilled body piece. Mount this with two screws on the side of your bench. Immediately above it, drill a hole through the bench top for the rod that it will hold. The rod may be a piece of ordinary, galvanized-iron water pipe or gas pipe, of the size rated as one-eighth inch and of any length desired. By adjusting the set screw as shown, the rod may be set at any height or withdrawn below the bench top. The device is seen in use in the photograph on page 192.



# Simple Stunts Reveal

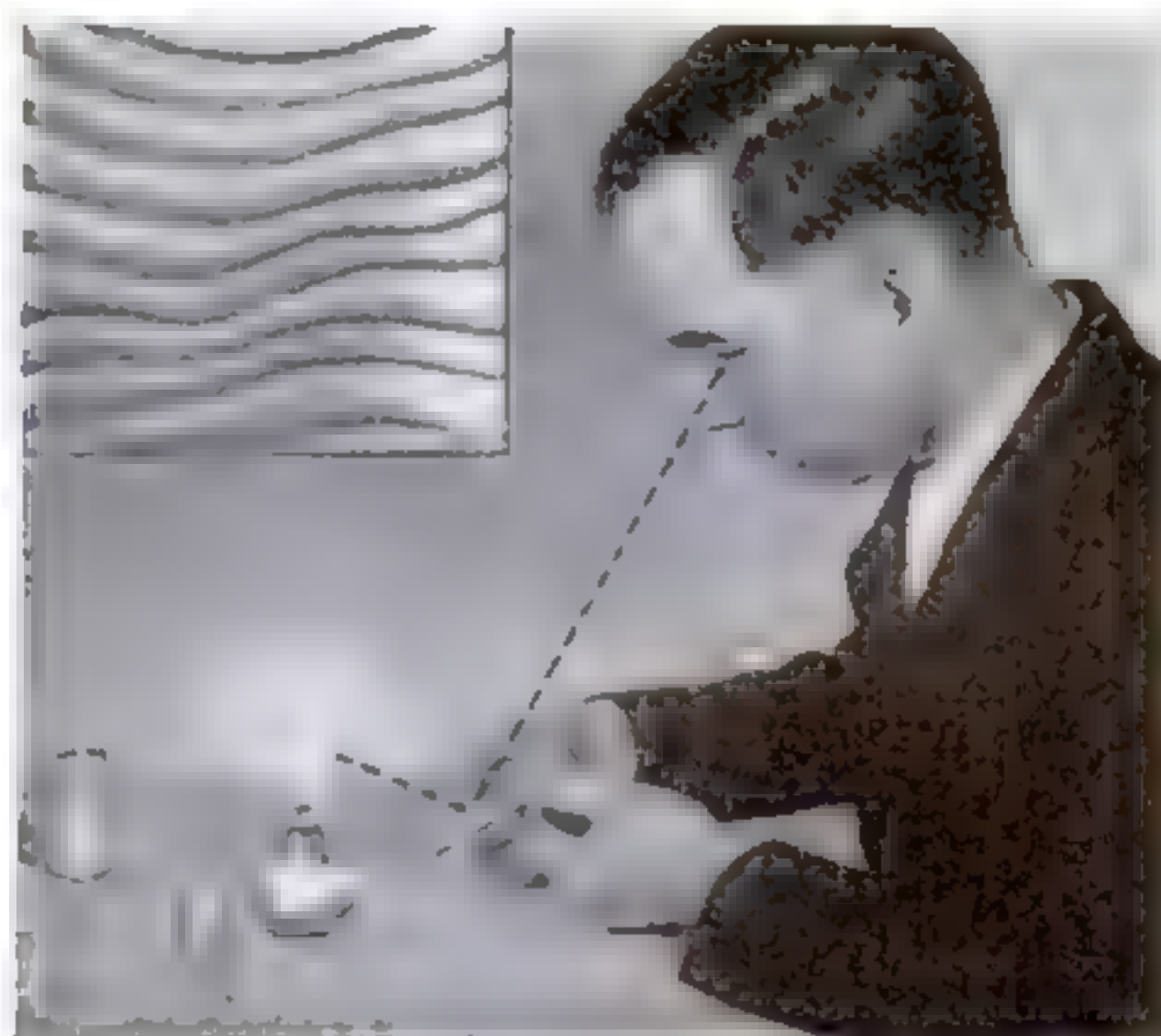


## Ball Balances Strangely on Current of Air

ATTACH a wire cage, holding a table-tennis ball, to the blower end of a small vacuum cleaner or hair dryer. Start the motor and hold the air tube upright. The ball may bob up and down, but remains in the center line of the cage, even when you tilt the tube as far as shown above. If it starts to fall, an opposing buoyant force is automatically produced by a low-pressure area on its upper side and a high-pressure area on its bottom.

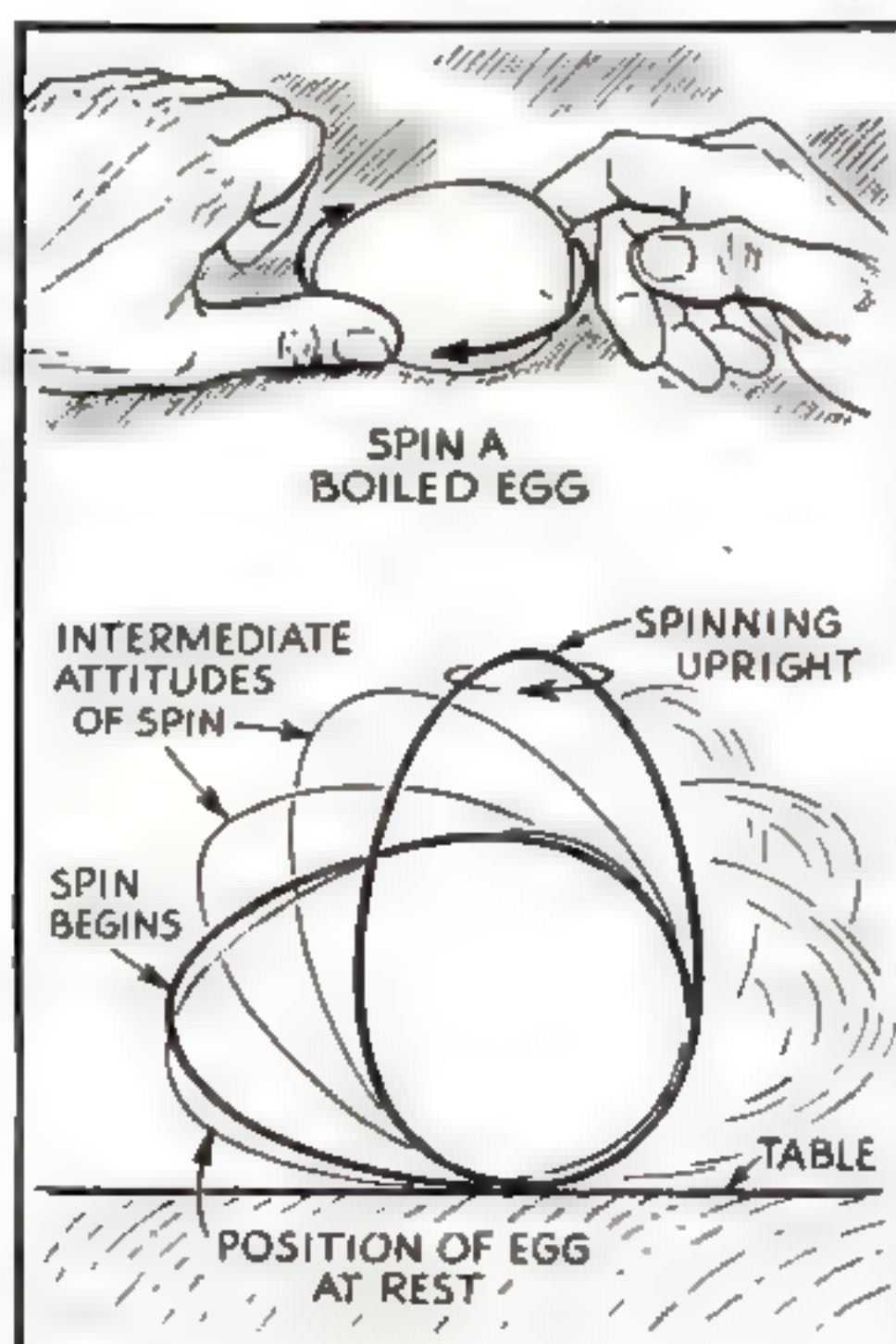
## Light Waves Measure Flatness of Glass

TO TEST the flatness of glass, press together two sheets. Use them as a mirror to view the yellow-tinted flame produced by sprinkling table salt upon an alcohol-lamp wick, or by holding the salt in a gas flame. Imperfect contact between the panes gives a double reflection of the light, and you will see black lines crossing the glass where the reflected light waves interfere with each other. The lines will be farther apart and less distorted with plate glass than with ordinary glass.



## Spinning Egg Stands Up on One End

SPIN a hard-boiled egg on a table top, as illustrated. In a moment it will turn upright and revolve on one end. The twirl that you give the egg spins it on a point to one side of its center of gravity, giving the egg an added rolling motion about its long axis. The combination of the spin and the roll produces a gyroscopic action that makes the egg stand on end, as illustrated at the right.



How the spinning egg stands up on end. Rotation in two directions at once produces a gyroscopic action

## Test Shows Candle Is Tiny Gas Plant

FROM a height of two to seven inches, a match flame will jump back and relight a candle that has just been put out. This shows that what burns in a candle flame is really a combustible gas formed from the wax by heat.





# Nature's Laws

**A Table Is Your Laboratory  
for Seven Mystifying Tests  
of Scientific Principles**

• • •

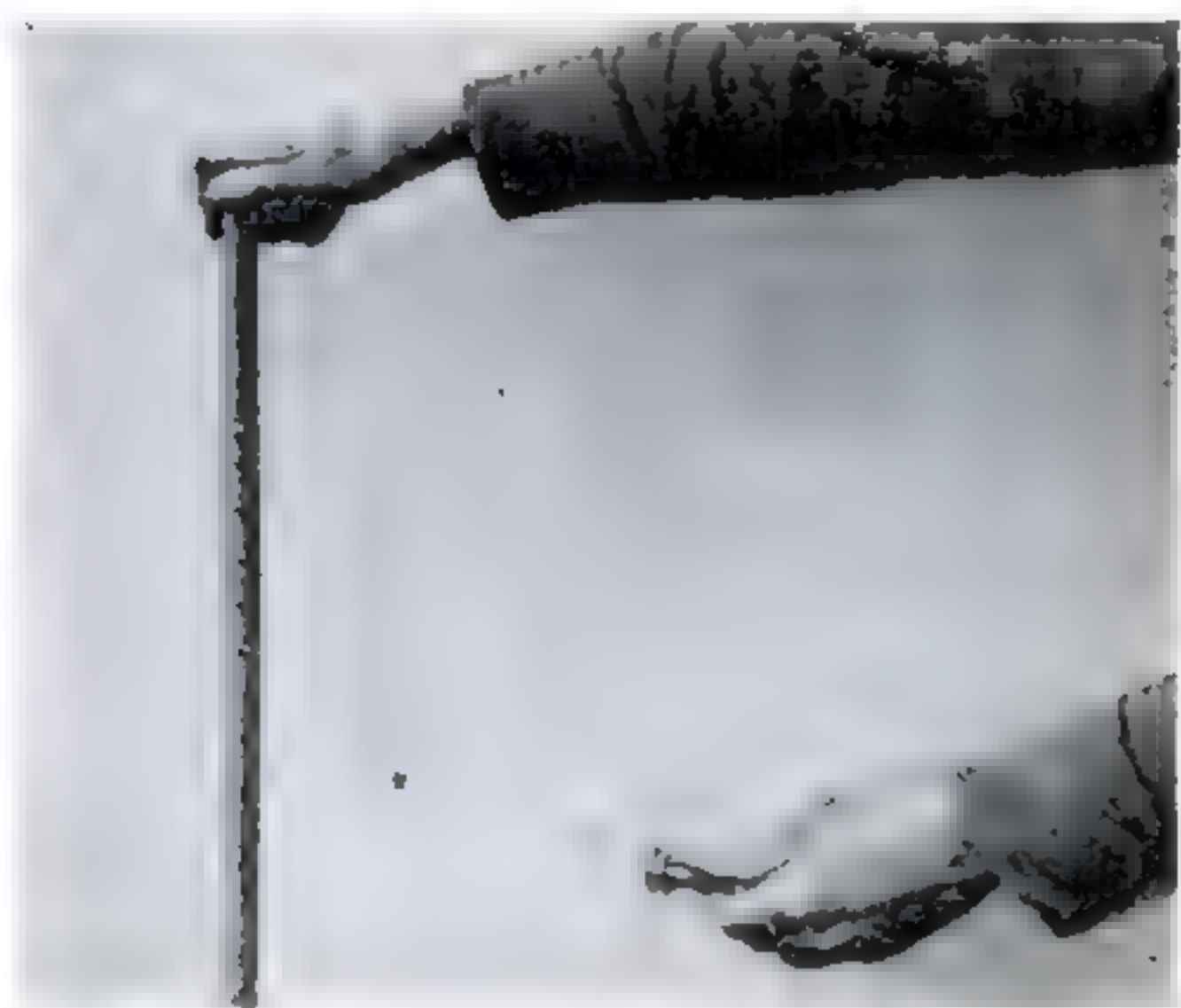
## The Farther It Winds, the Faster It Goes

ATTACH a small weight to a broomstick with a string or thread, and start it whirling as shown below. As the string winds up, the weight races faster and faster around the stick. A physicist would say that its decreasing moment of inertia is responsible. In much the same way, the winds in tornadoes and hurricanes reach enormous velocities as they approach the center of the storm.



## Balance Tipped by Weight of Invisible Vapor

MAKE two paper boxes and mount them on strips of cardboard. Balance them on a pencil supported by a pile of books, as illustrated above. Place a few drops of carbon tetrachloride, a common noninflammable cleaning fluid, in a tumbler. Allow a few seconds for some vapor to form, and then tilt the glass over one of the boxes, exactly as if you were pouring some tangible fluid. Although invisible, the heavy vapor that flows into the box will swing this side downward. Pour some of the vapor into the other side, and the boxes will balance again. The boxes tilt because of the added weight when the carbon tetrachloride, which is about six times as heavy as air, displaces the air they contain. Carbon dioxide gas, made by mixing baking soda and vinegar in a tumbler, can be used for the same demonstration, but the effect is less pronounced.



## Explaining the Colored Rings Around Sun and Moon

DUST a small quantity of lycopodium powder, obtained from a drug store, on a piece of glass. Look through the pane at a distant lamp bulb. You will see colored rings around the light, produced by a phenomenon called diffraction. The same effect accounts for colored borders encircling bright objects viewed through a mist, including the so-called "coronas" or "glories" of the sun and moon. These are caused by particles of moisture in the air. They are distin-

guished from the larger rings called "halos," which are produced around the sun and moon by floating ice crystals in the atmosphere.



Through a glass dusted with the powder, rings are seen around the light





Crystals of dextrose sugar in honey, as seen by polarized light. At left, a drop of honey taken from a comb is being placed on the slide for observation

## YOUR MICROSCOPE SHOWS Marvels in Common Foods

**R**ARE jewels in a drop of honey, curious coil springs in a celery stem, delicate filaments on moldy bread—these are only a few of the wonders that your microscope will uncover for you right in the kitchen of your home. Perhaps you have always thought of the kitchen as a prosaic but necessary part of the house, from which tempting smells and appetizing foods appear at regular intervals. An exploring expedition with your magic lenses will reveal it as a place of magic and mystery, in which nature displays many of her most beautiful and fascinating creations.

Take, for instance, a comb of honey or a jar of extracted honey. Up to now you probably have considered honey as little more than a mass of liquid sweetness. With a toothpick transfer a drop of it to the center of a clean slide and press a clean cover glass over it. Examine it carefully at 100 or 150 diameters. You will find, almost invariably, a number of pollen grains. Just what kind of pollen these will be, it is difficult to predict, for scores of varieties are to be found in honey. You

can spend days and weeks studying nothing but the pollen in honey; a European microscopist has written a book on the subject. Another thing you will find in honey is yeast, usually in the spore stage. For more detailed study of such objects, switch to a higher magnification.

Look carefully and you may see a number of crystals, sometimes clumped together to form little clusters, and sometimes scattered about singly like stray fence pickets. If your microscope has a substage diaphragm, stopping it down will increase the visibility. Dark-field illumination is another way of rendering the crystals easily visible. Perhaps the best method of all is to employ polarized light, which makes some of the crystals appear luminous, others darker than the surrounding field, and in still others produces beautiful rainbow colors. These crystals are almost invariably composed of dextrose, which is also known as glucose or grape sugar. Honey is a solution of three sugars—dextrose, sucrose, and levulose. Dextrose forms crystals easily, sucrose rarely, and levulose not at all.

By  
**MORTON C.  
WALLING**



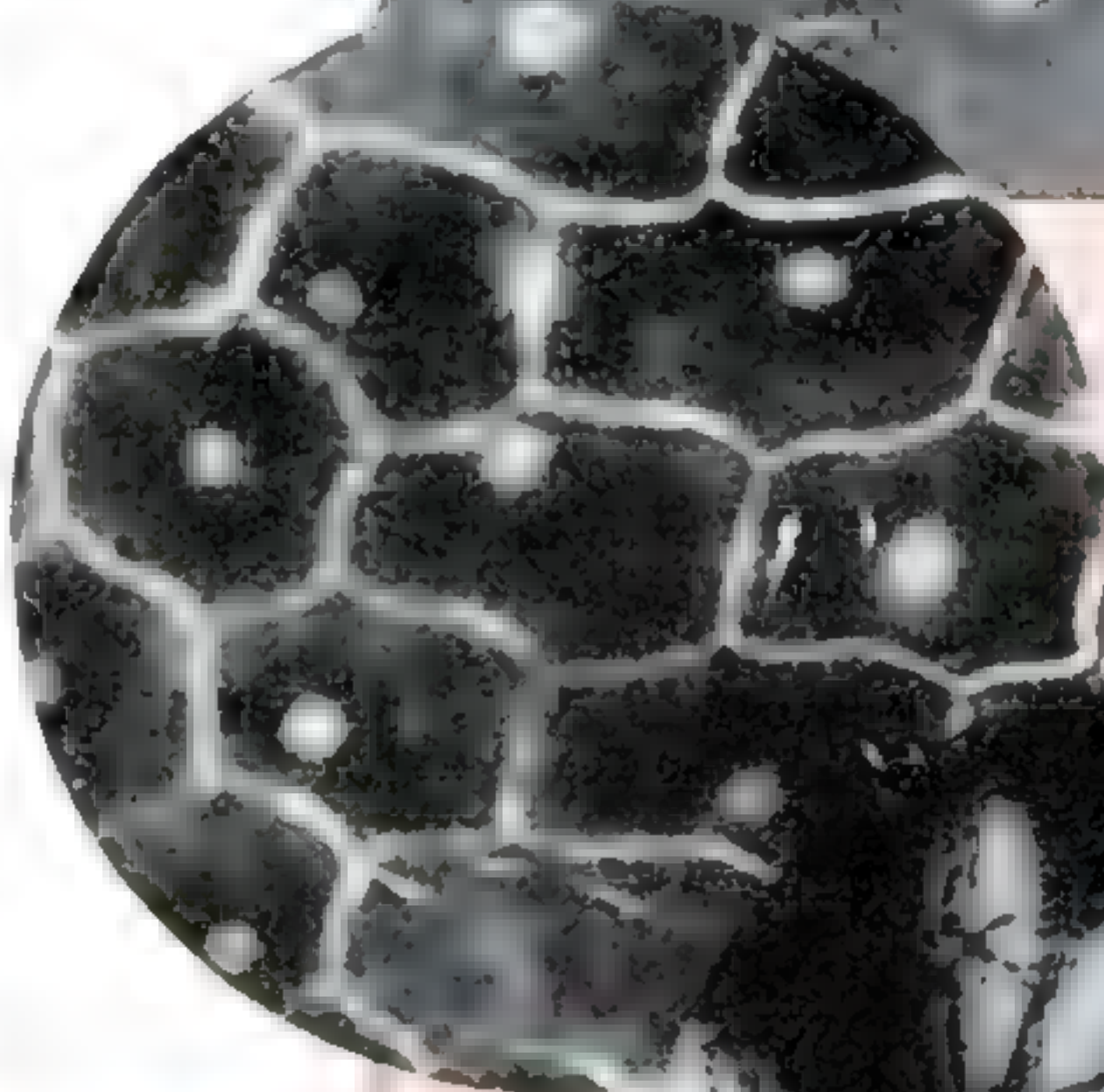
Speaking of crystals, your kitchen expedition probably will unearth some other forms in the most unexpected places. In butter, for instance. Smear a little butter on a slide and look at it at, say, 100 diameters. Unless it is a special kind of butter, you will discover a number of tiny, glasslike cubes. These are crystals of ordinary salt (sodium chloride). You can see the same kind, in great numbers, by evaporating a little salt water on a slide. Probably you will see a few crystals that are not cubical in form, too, for the salt may contain traces of iodine compounds and other chemicals.

Imprisoned within the cells of many vegetable tissues, such as those of onion and various house plants including begonia and cactus, you can discover still other crystals. These are composed of either carbonate or oxalate of lime, with the latter the more common. Calcium oxalate crystals occur both singly and in clusters. You should have little difficulty in recognizing them, for they look like no other part of the plant cell. The clusters, particularly, are easy to spot, for they resemble the spike-studded ends of ancient war clubs. These crystals are, as far as botanists know, waste products of the plant, and have no usefulness to it except to provide a way of getting rid of oxalic acid and calcium.

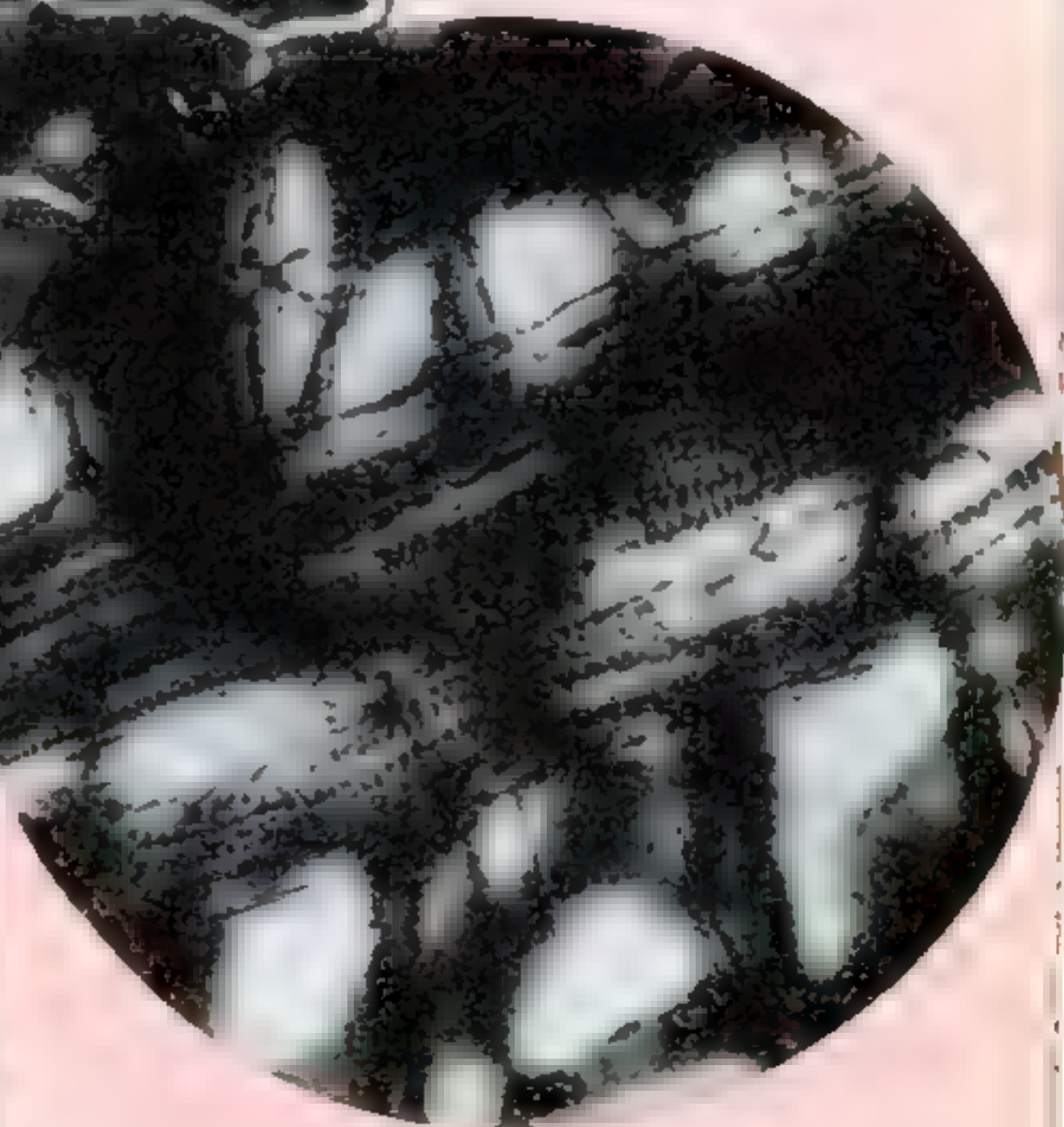
Although yeast plants may be observed in your examination of honey, you will find it worth while to grow a few for the purpose of study. Place some compressed

yeast or a yeast tablet in a glass of water sweetened with sugar or sirup, let it stand for a few days, and then examine a smear of the sediment at 400 or so diameters. It is interesting to observe yeast cells in the process of budding, the method by which they reproduce. Yeast can be found in the sediment in beer, and in fruits that have spoiled by fermentation.

Another way in which food spoils, and incidentally produces a rich store of material



Peeling membrane from a piece of onion. Photomicrograph at left, made with dark-field illumination, shows the glasslike cells and prominent nuclei



Longitudinal section of a celery stem. Note the spiral-walled ducts that resemble tiny coil springs. Cross sections of celery and other vegetable materials can be cut easily with a kitchen knife





Bacteria in buttermilk. The picture at upper left shows how they can be "fixed" (killed and preserved). Put a little alcohol on a drop of buttermilk on a slide and then ignite it. Stain the specimen as seen at left

for the microscopist, is by molding. Molds or fungi constitute an even broader field than pollen grains, for mold spores are practically everywhere, waiting a chance to grow. If the cook has a piece of moldy bread or cake, don't let her throw it away, but take it to your microscope, lift off some of the mold filaments with tweezers, and examine them at fifty diameters or more. Watch particularly for the tiny, ball-shaped spore cases that grow on the ends of slender stalks and, when ripe, give forth myriads of dustlike spores. Many of the common molds are extremely beautiful under the microscope. And it is interesting to remember that they also can be extremely costly, for mold causes millions of dollars worth of fruit spoilage every year.

The tissues of almost every garden vegetable offer much material for the microscopist. In stems, such as those of celery, you can always discover the spiral-walled ducts that resemble tiny coil springs, as well as other

features worth hours of observation. If you haven't yet seen the green chlorophyll disks in the cells of a leaf, raid the refrigerator for some lettuce or other green, leafy vegetable; or snatch a leaf from one of the potted plants in the kitchen window. Cut thin sections for mounting in water on a slide. Another kitchen vegetable that never fails to provide an interesting specimen is the lowly onion. It is easy to peel a bit of the membrane from one of the layers and spread it on a slide in a drop of water. This membrane, you will find, is composed of a neatly arranged layer of cells whose nuclei show plainly; if they do not, it is a simple matter to stain them with dilute tincture of iodine.

**S**IMILAR cellular arrangement can be observed in the membrane that covers an ordinary bean cotyledon, or seed leaf. Soak the bean in water for a day or so, and you can remove the bean's "shell" and separate the two cotyledons (halves). With a sharp knife or dissecting needle, remove some of the membrane from one of the cotyledons, stain it with Loeffler's methylene blue or other stain that will color vegetable cells, and you have something really beautiful. This membrane resembles, when thus prepared,

## ● YOU DON'T KNOW YOUR GROCERIES UNTIL YOU START



an intricate mosaic or carpet pattern; and it might serve as a design for dress goods.

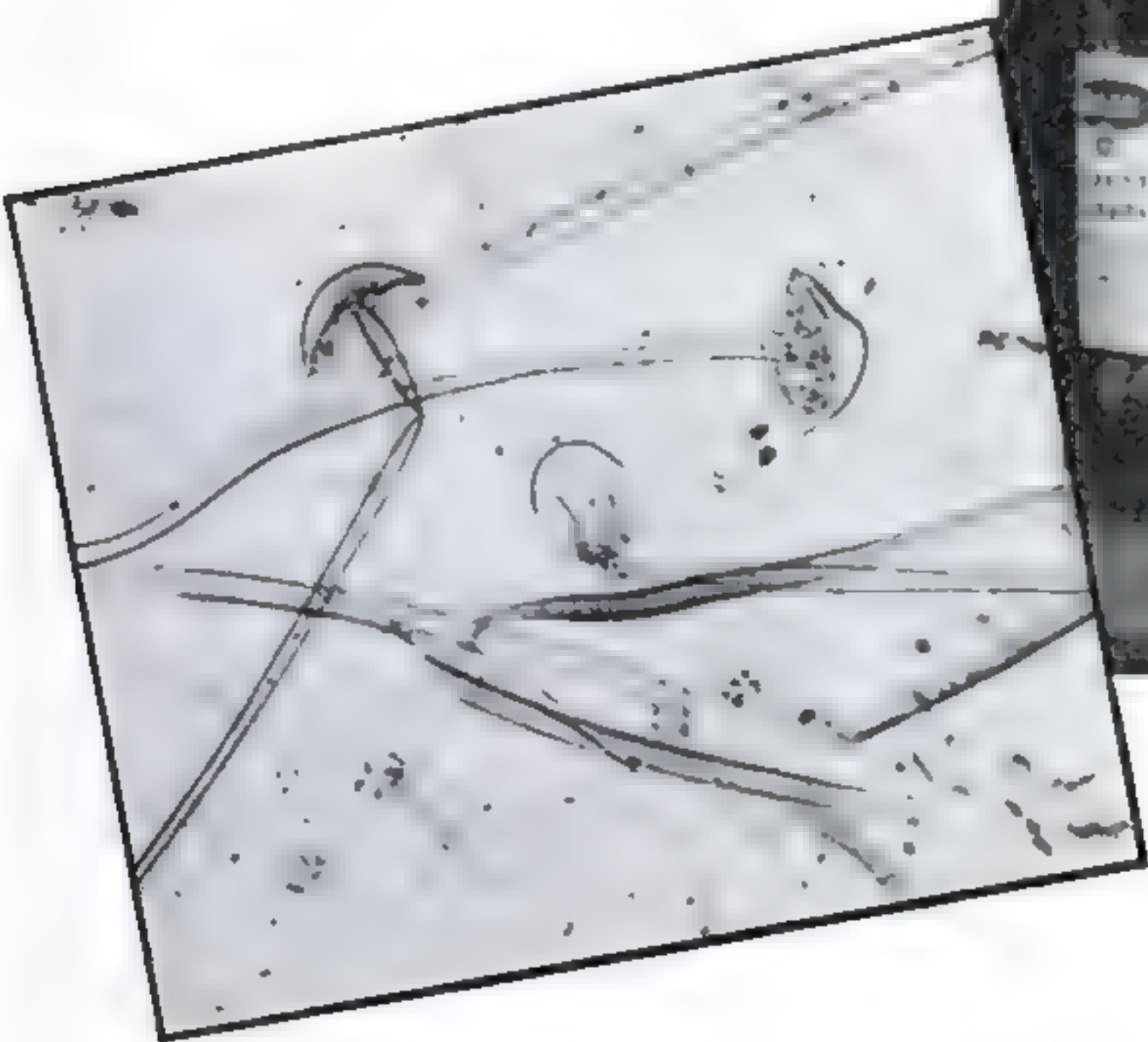
In a similar way, you can separate and examine the thin membranes from other vegetables and fruits. Comparison of the cells as to shape, size, and arrangement forms another interesting study.

Seeds—poppy, celery, caraway, and even those fed to the canary that sings in the kitchen—offer another field for microscopic exploration. Because of their size, seeds can be studied at low magnifications, sometimes with a simple hand magnifier. Besides examining their surface details, you can crack or cut them open and note their internal structure. Sprout a few by placing them on damp cloth for a few days, and you can study the development of the plant. In most seeds, you can observe without difficulty the embryo plant that is lying dormant until conditions are right for its development. In the bean, for instance, you can find this plant nestled between the cotyledons, at one end. Such tiny plants are perfect and complete, and require only growth to develop into full-size specimens. The cotyledons provide food until the root system is working.

If you are interested in bacteriology, and have a microscope that magnifies 500 or so diameters with good definition, you will enjoy inspecting the kitchen bacteria. One of the best places to find them is in milk—buttermilk particularly, and also in sweet milk and in cream that has soured. You have, let us say, a quantity of buttermilk. To see the bacteria in it, you have to go through a process of slide preparation, which is not at all difficult. On a clean 1" by 3" slide place a small

drop of buttermilk, and spread it out into a thin layer. Let it dry, and then with the slide lying level on the table, let two or three drops of alcohol (70% to absolute grain alcohol, denatured or otherwise) fall on the smear. As soon as the alcohol has spread out into a film, ignite it with a match, and let it burn to dryness. This fixes the bacteria—that is, kills them and preserves them in their natural form. To make the bacteria visible, it is necessary to stain them. This is done by letting a few drops of some stain such as Loeffler's methylene blue or a saturated alcoholic solution of methyl violet flow over the preparation. This probably will overstain, so it is necessary to rinse the preparation in alcohol, which removes excess stain and makes the bacteria stand out prominently. (If you do not have the above stains, try mercurochrome or iodine.) Rinse in water, let the preparation dry, and you are ready to examine it, either with or without a cover glass.

For a permanent preparation, simply add a drop of balsam and press a thin cover glass in place. When the milk contains fatty particles of cream, an additional step is desirable. After the smear has been fixed, immerse the slide in a jar (*Continued on page 234*)



#### HOW TO GROW YOUR OWN YEAST PLANTS

Drop a yeast tablet, or a piece of compressed yeast, into a glass of water sweetened with sirup. After a few days the sediment will contain yeast plants. At left, mold filaments and spore cases from stale bread

## EXPLORING THE KITCHEN WITH YOUR MAGIC LENSES ●



# New Aids for Radio Fans



## Floor Lamp Has Built-In Radio

ITS tuning controls mounted within easy reach of a person seated in an armchair, a combined radio and floor lamp now available houses a complete four-tube, A.C.-D.C. receiving set in its base, and a dynamic loudspeaker at its top. Available in several color combinations, the lamp is five and a quarter feet tall, with a shade nineteen inches in diameter, and is designed to give six-way lighting. A single plug-in cord provides power for both lamp and radio.

This floor-lamp radio adds comfort to a living room. Inset shows tuning unit

## Handy Regulator for Amplifiers

BY MEANS of the new hand-size control panel shown below, the sound volume of amplifying equipment in theaters or outdoor auditoriums may be accurately regulated by an operator sitting right in the audience where he can judge the sound from the spectator's point of view. So small that it fits in the palm of the hand, the unit is connected to the amplifying equipment by a three-wire cable that may be of any length necessary. Besides its usefulness in theaters as a permanent sound control, the unit makes a handy accessory for portable sound-amplifying equipment, to insure proper volume.



Theater or outdoor amplifiers are controlled remotely by adjusting the dial



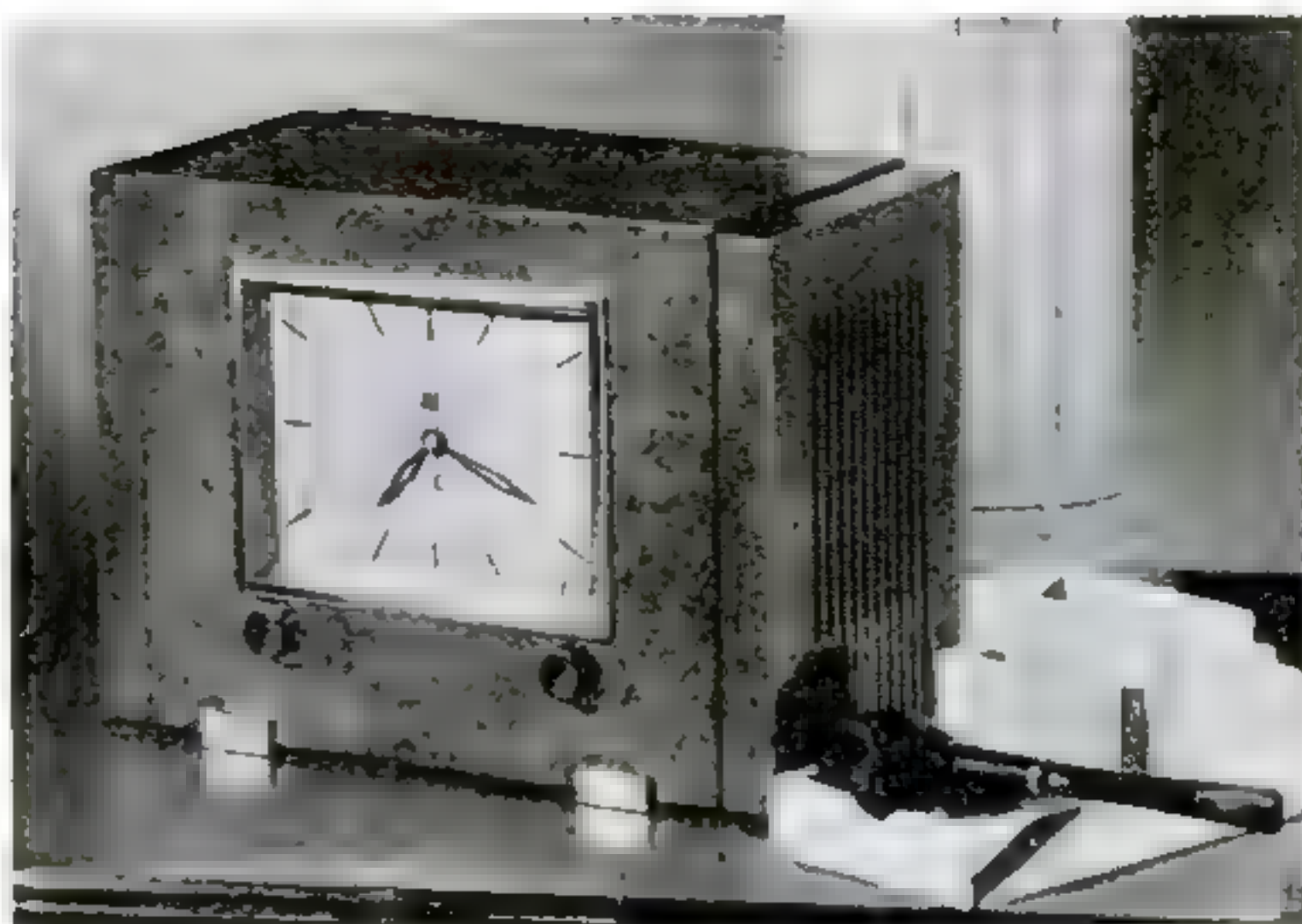
## Plug-In Control Tunes Radio Set

PLUGGED into any electric outlet in the house, the novel remote control pictured above switches the household radio on or off, selects stations, and tunes them in accurately by means of buttons and a dial. Said to work perfectly with any radio receiver, the unit requires no changes in the radio's design before operation, and the only connection to the receiver is through the house wiring.



# Attractive Clock-Radio Does Triple Duty

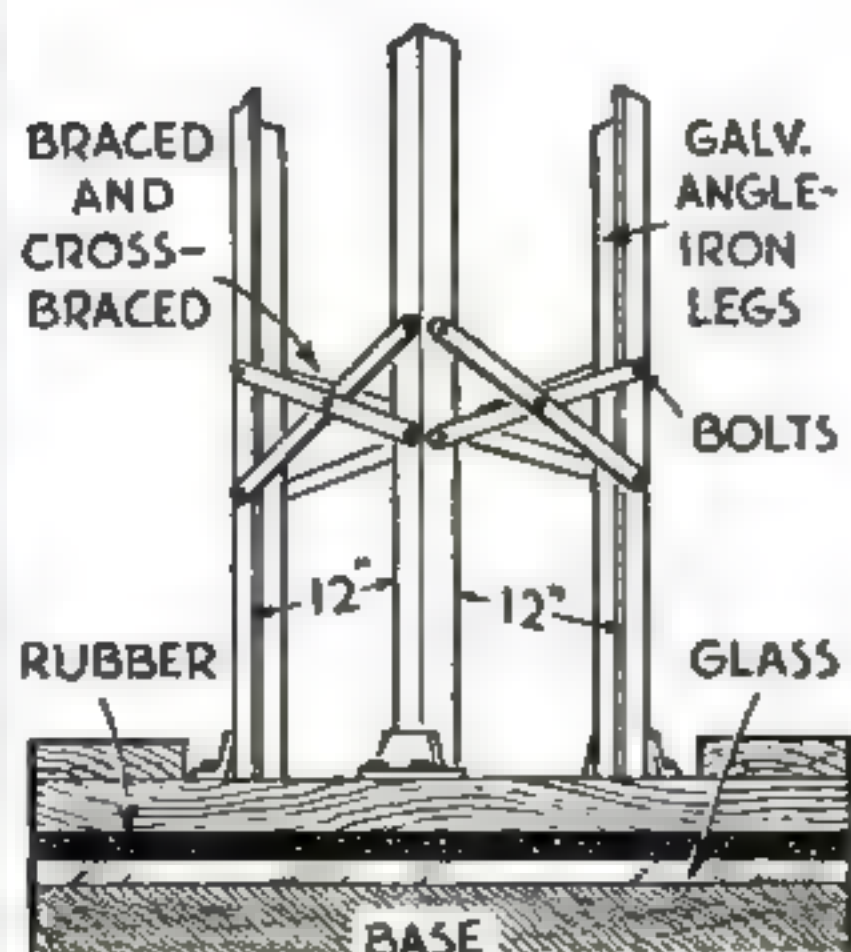
PERFORMING the duty of an alarm clock as well as a timepiece and a radio, a new clock-radio can be set to tune in any program desired at any predetermined time. Thus it may be used to wake you in the morning, or remind you of any daily duties, by automatically switching on. Looking more like a clock than a radio, the compact receiver has its tuning dial cleverly hidden in one corner of its clock face. The radio can also be made to turn itself off when a program is completed.



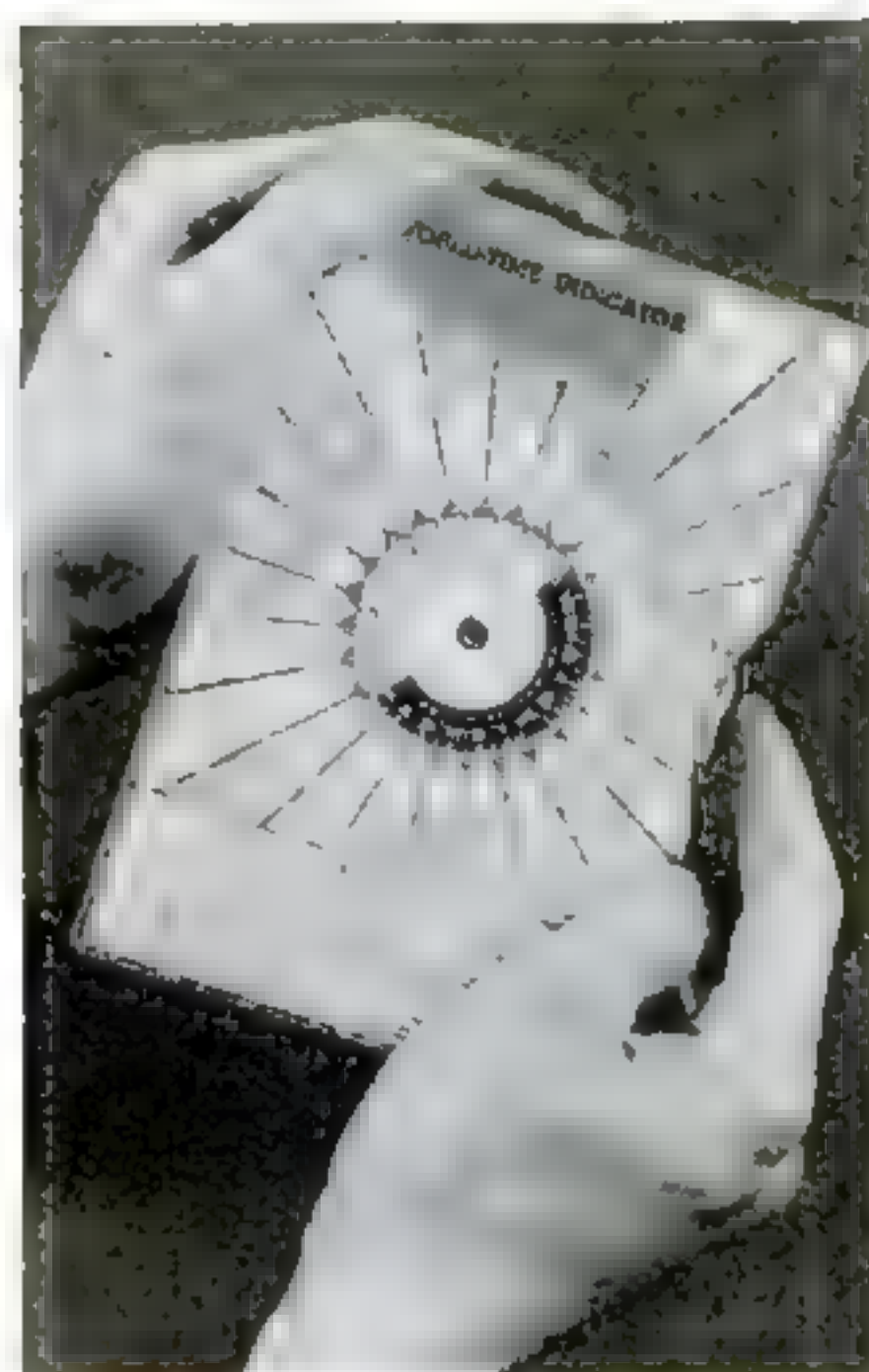
You can set this clock-radio to wake you up to music

# Prefabricated Masts Aid Amateurs

AVAILABLE in uniform sections which are easily bolted together, steel towers for amateurs now come in knock-down form for use with wire antennas or as modern vertical radiators. Masts up to 200 feet tall can be erected easily by three men. The tower sections consist of three side members trussed together with steel crosspieces evenly spaced. Guy wires of any desired length are available, and the tower, mounted on its pedestal of wood, rubber, and glass needs no anchorage, merely a solid footing.



How radio mast is insulated by wood, rubber, and plate glass



# Adjustable Dial Tells World Time

SHORT-WAVE fans can save themselves the trouble of figuring out international times by using the handy world-time chart shown. The device, made of durable cardboard, has a revolving disk marked with A.M. and P.M. hours. Setting the disk with the time of day opposite the radial section on the card corresponding to one's own locality shows the time of day opposite other localities marked in the remaining radial sections of the card. On the back of the device is a list of principal short-wave stations of the world for the convenience of the user.



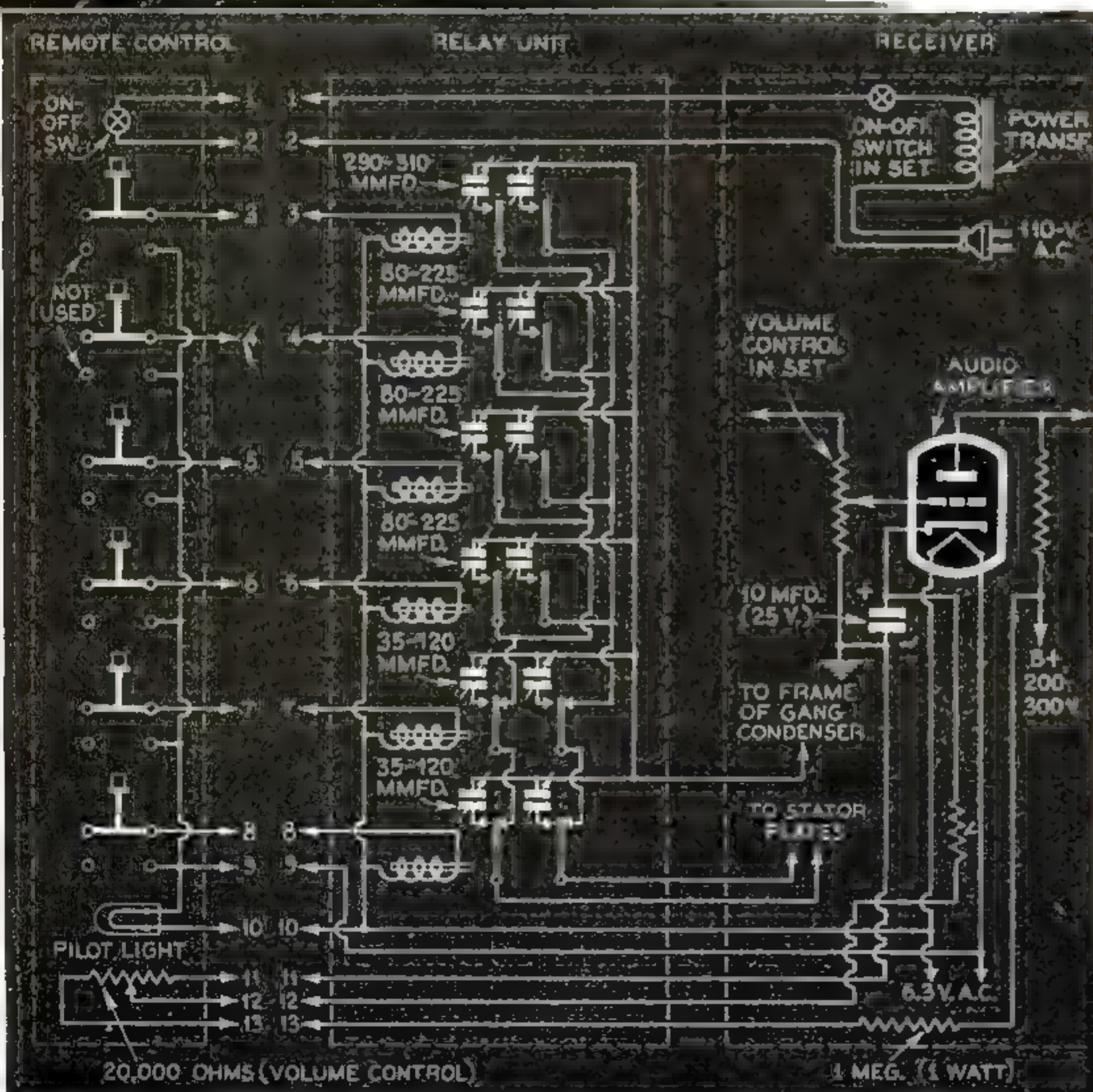
# Lazy-Man's Tuner

SIMPLIFIED PUSH-BUTTON REMOTE-CONTROL

IF YOU have always wanted a simplified remote-control tuner for your broadcast receiver here is an easily built unit that needs neither motors nor expensive equipment and requires only a minimum of connections to

your receiver circuit. With it, you can turn your set on or off, select any one of six stations merely by pushing a button, and control the volume; all without budging from your armchair. Provided with a long cable, the small remote-control box can be carried to any room in your house.

Basically, the unit operates by automatically connecting into the receiver preset padding condensers that tune the circuit in place of the usual tuning condenser. Operating one of the buttons on the push-button tuner switch panel in the remote-control box energizes a corresponding relay at the receiver which serves to connect the desired condensers into the circuit. In the unit shown, six tuning buttons are em-



This comprehensive diagram shows the wiring of the remote-control tuner, the relay system which tunes the radio circuit, and the receiver connections

By  
**HOWARD G.  
McENTEE**



# Fits Any Broadcast Set

UNIT IS EASILY ASSEMBLED FROM INEXPENSIVE PARTS

played to operate six relays, which in turn make the condenser connections and provide a selection of six stations. Volume control is obtained by a potentiometer built into the control box.

Designed for use with the conventional broadcast superheterodyne or tuned radio-frequency set employing a two-section tuning condenser, the unit makes use of twelve padding condensers, two for each relay circuit. When a relay is operated, one of these pre-tuned condensers is connected across each section of the two-section condenser. In receivers employing three-section condensers, three padding condensers must be used with each circuit, and three-pole relays will be required to make the necessary connections.

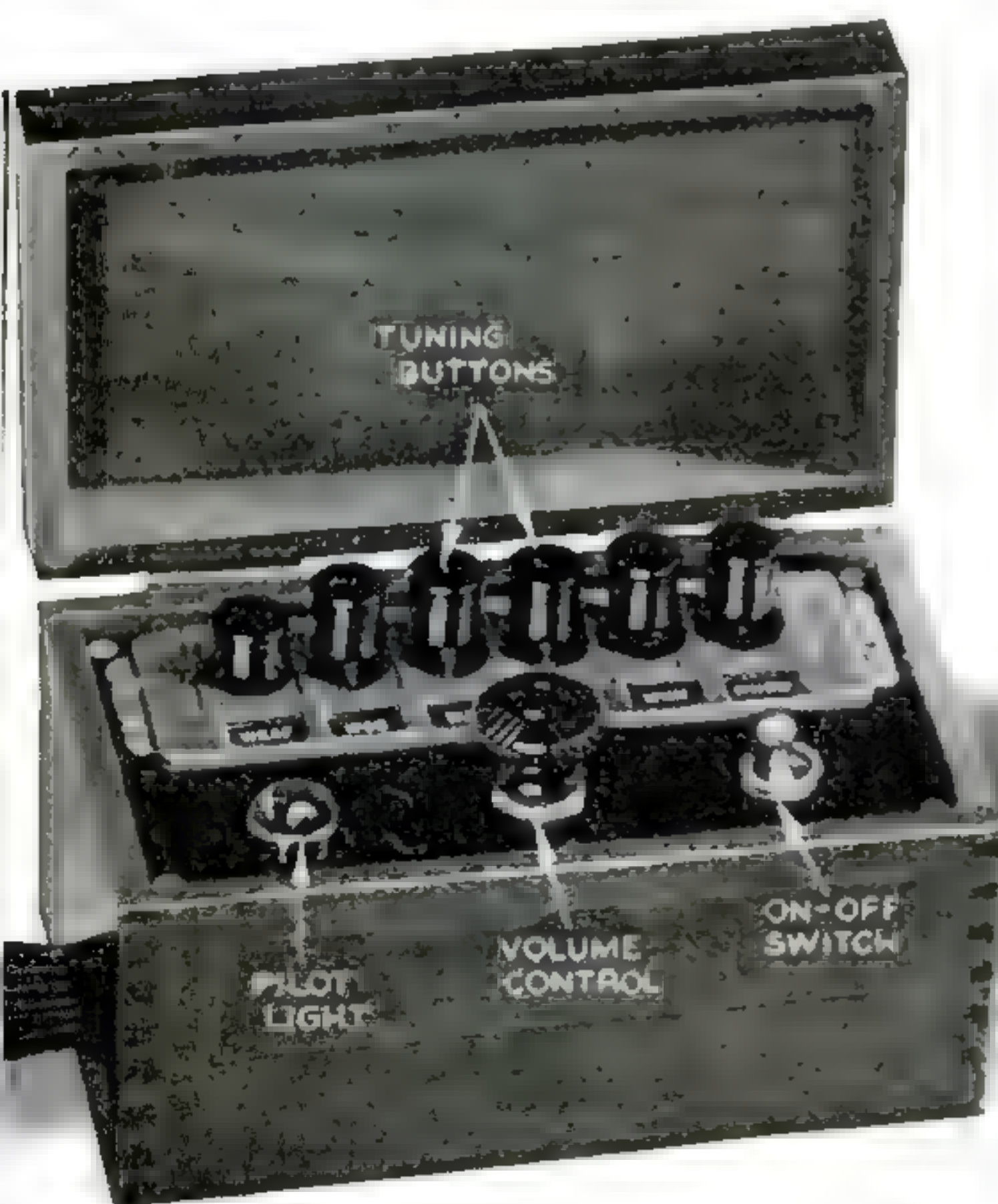
The actual details of construction should



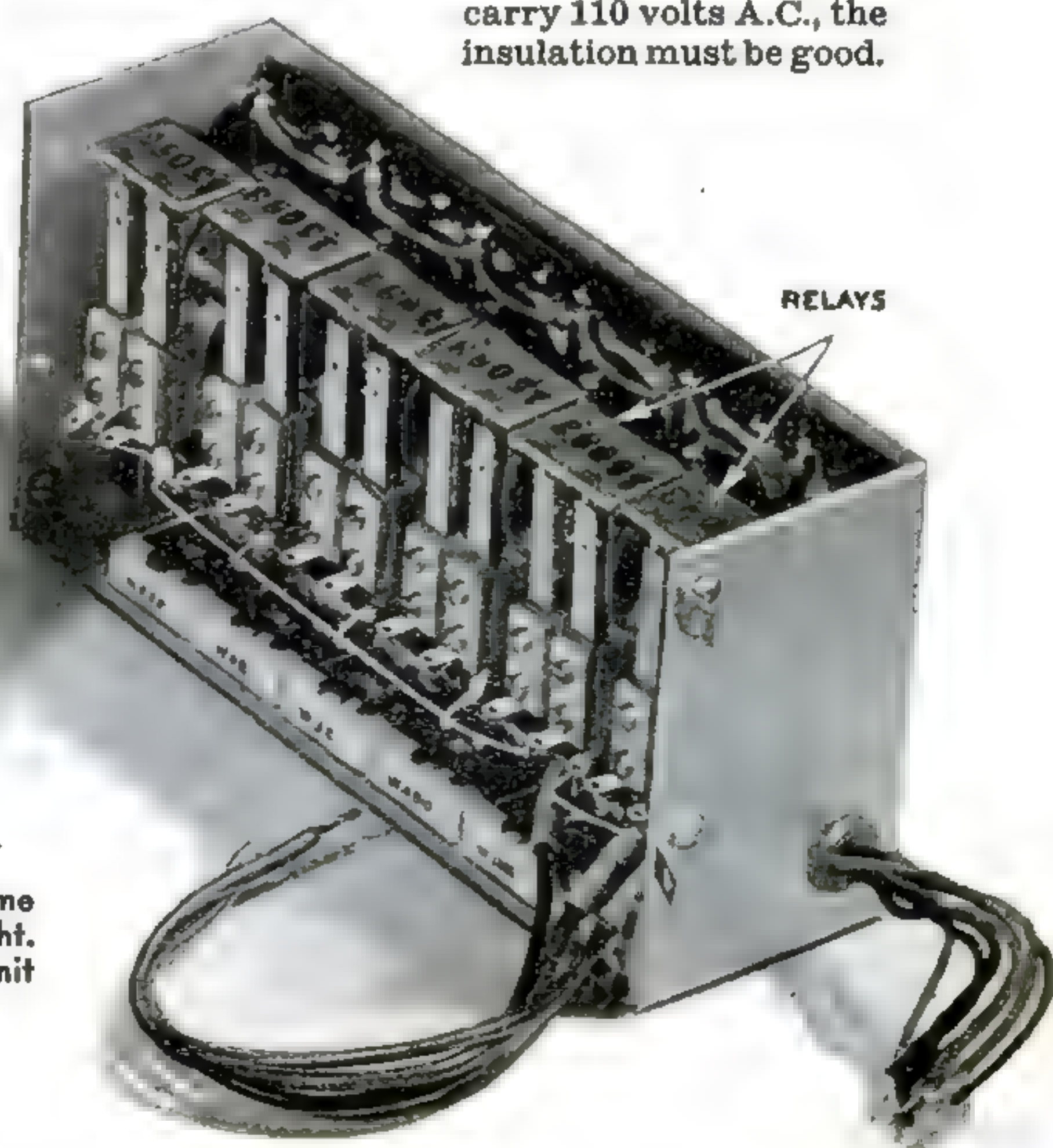
Placed beside your chair, the tuner lets you adjust your radio with ease

not cause the set builder any great difficulty. The box for the remote-control unit is a standard wooden card-file case, 3" by 5", trimmed off until it stands 3¼" high, outside measurement. A ¼"-thick composition panel holds the push-button controls, a pilot light, and an on-off switch. A slot is cut in one end for the cable. Incidentally, the cable may be of any length and of any type so long as it has the necessary number of conductors.

However, since it must carry 110 volts A.C., the insulation must be good.



The push-button case also houses a volume control, an on-off switch, and a pilot light. Brackets aid in mounting the relay unit





## LIST OF PARTS

One double padding condenser, 290-310 mmfd.

Two double padding condensers, 35-120 mmfd.

Three double padding condensers, 80-225 mmfd.

Electrolytic condenser, 10 mfd., 25 volt.

Variable resistor, 20,000 ohms.

Resistor, 1 watt, 1 meg.

Two relays, 6 volt, A.C., double-pole, double-throw.

Four relays, 6 volt, A.C., double-pole, single-throw.

Push-button tuning unit, six buttons.

Thirteen-wire cable.

Fifteen-connection plug and socket.

*Miscellaneous:*—Pilot lamp and socket, control box and panel, single-pole, single-throw toggle switch, wire, etc.

The relay unit can be fastened directly to the receiver chassis. It measures  $2\frac{1}{4}$ " by  $3\frac{3}{4}$ " by  $7\frac{1}{2}$ ". Here the six relays, controlled by the remote-control buttons, make the necessary connections between the padding condensers across each section of the receiver's tuning condenser. In this unit, the standard fifteen-connection socket for the control cable is also mounted.

Should the cable be removed at any time, the receiver will not operate unless a wire jumper is connected between the plug terminals 11 and 12, and 1 and 2 (see diagram).

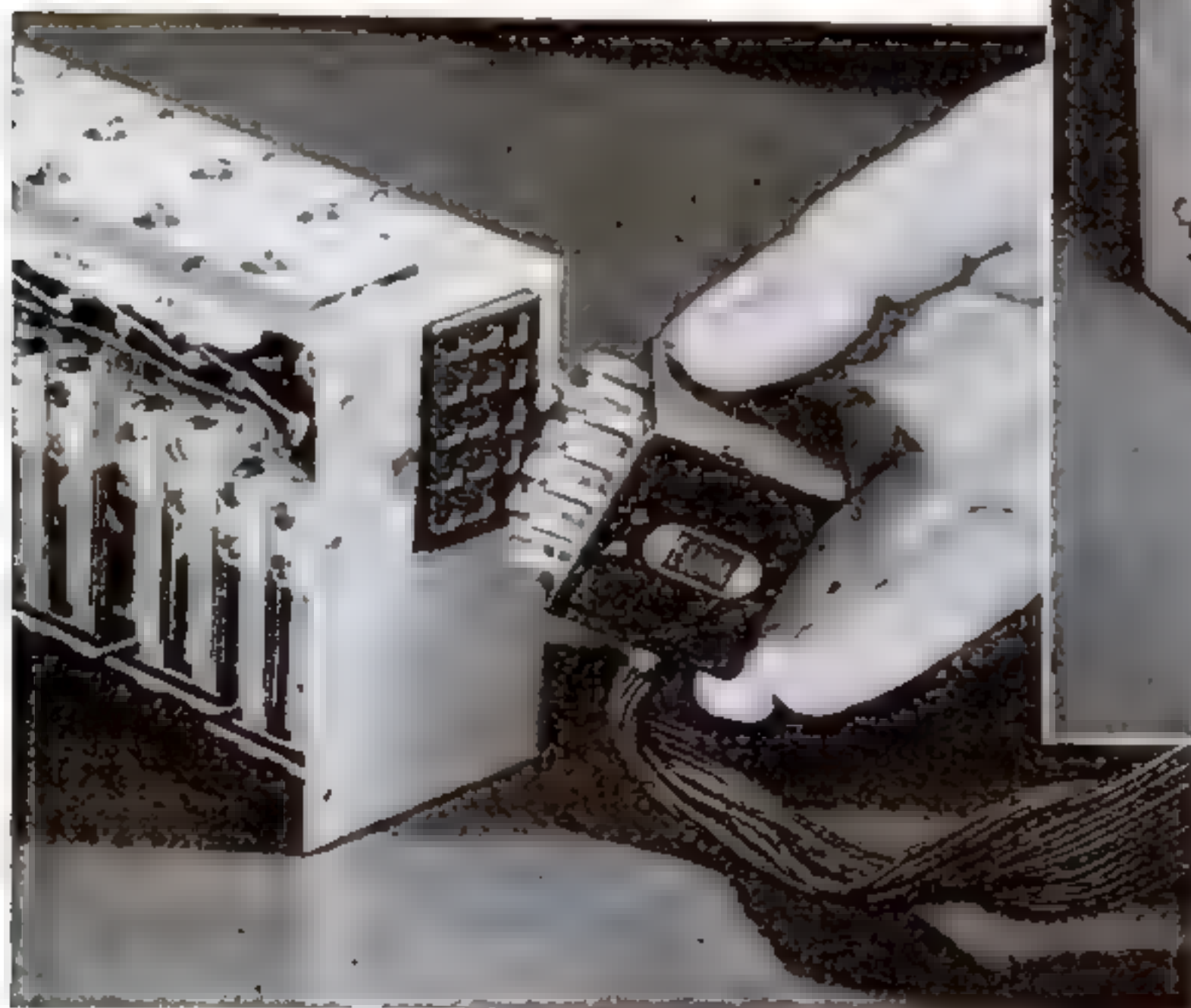
It will be noted that relays 1 and 2 have their contacts connected somewhat differently from the others. When either of these operates, all connections

to the following relays are automatically opened. This is necessary to eliminate the unavoidable stray capacity in the relay connections. The four other relays may be of the double-pole, single-throw type, with contacts closed when the relay is in the "make" position.

The initial tuning of the padding condensers can be accomplished easily. They should be adjusted, section by section, until the loudest response for each desired station is obtained. Any type of tuning indicator on the receiver is a great help at this stage. The condenser values shown allow full coverage over the band.

Care must be exercised in setting the remote volume control. With the latter set at full volume, turn the receiver volume control up until the receiver output is louder than normal. Then reduce it to the desired level with the remote volume control.

When using the remote control, make sure that the receiver's tuning condenser is turned all the way out (to the high-frequency end of the dial). This procedure must, of course, also be followed during the initial tuning of the padding condensers.



In pretuning the padding condensers, they should be adjusted with a screw driver to give maximum volume on the desired stations. A multiple plug makes the relay connections



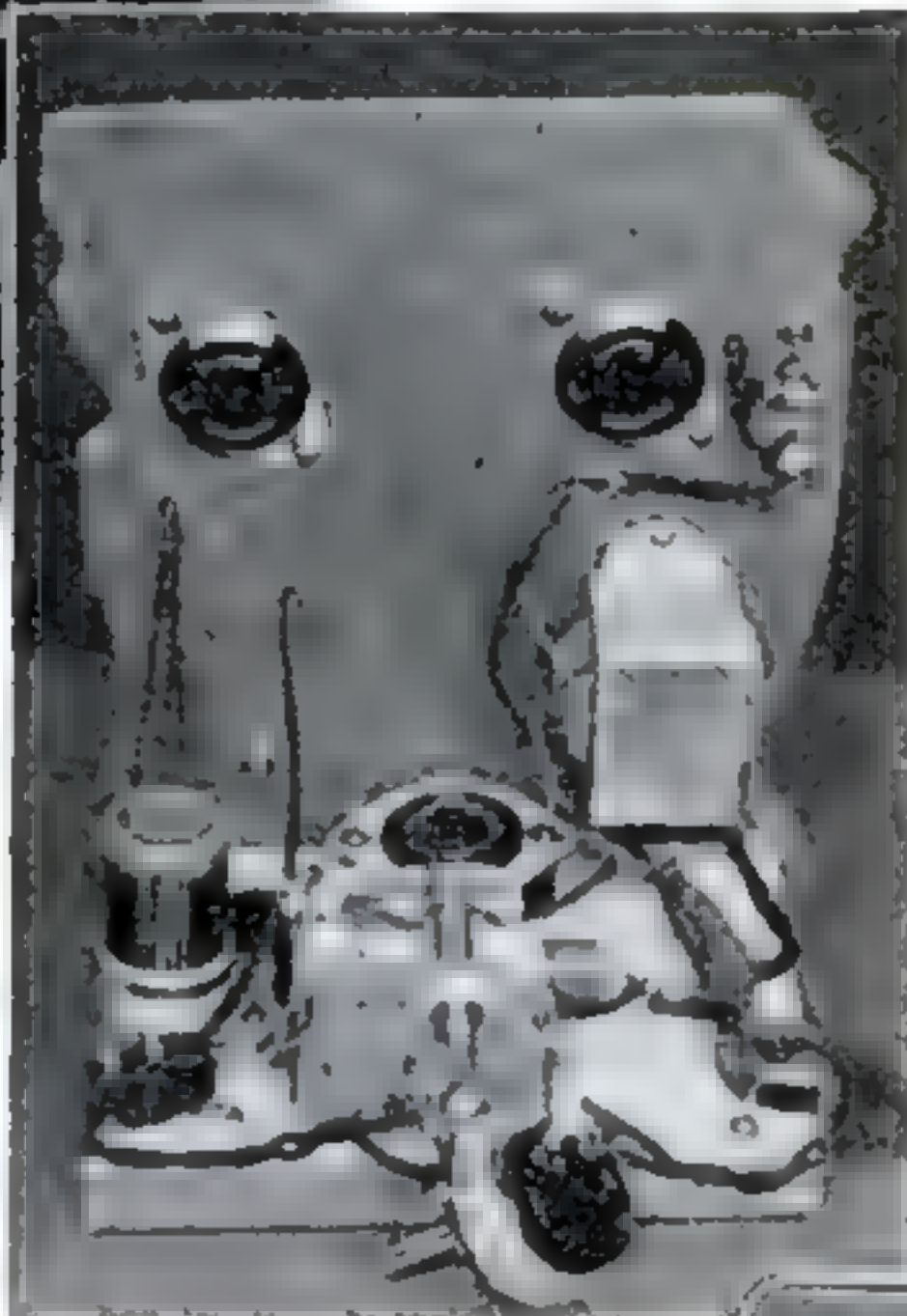
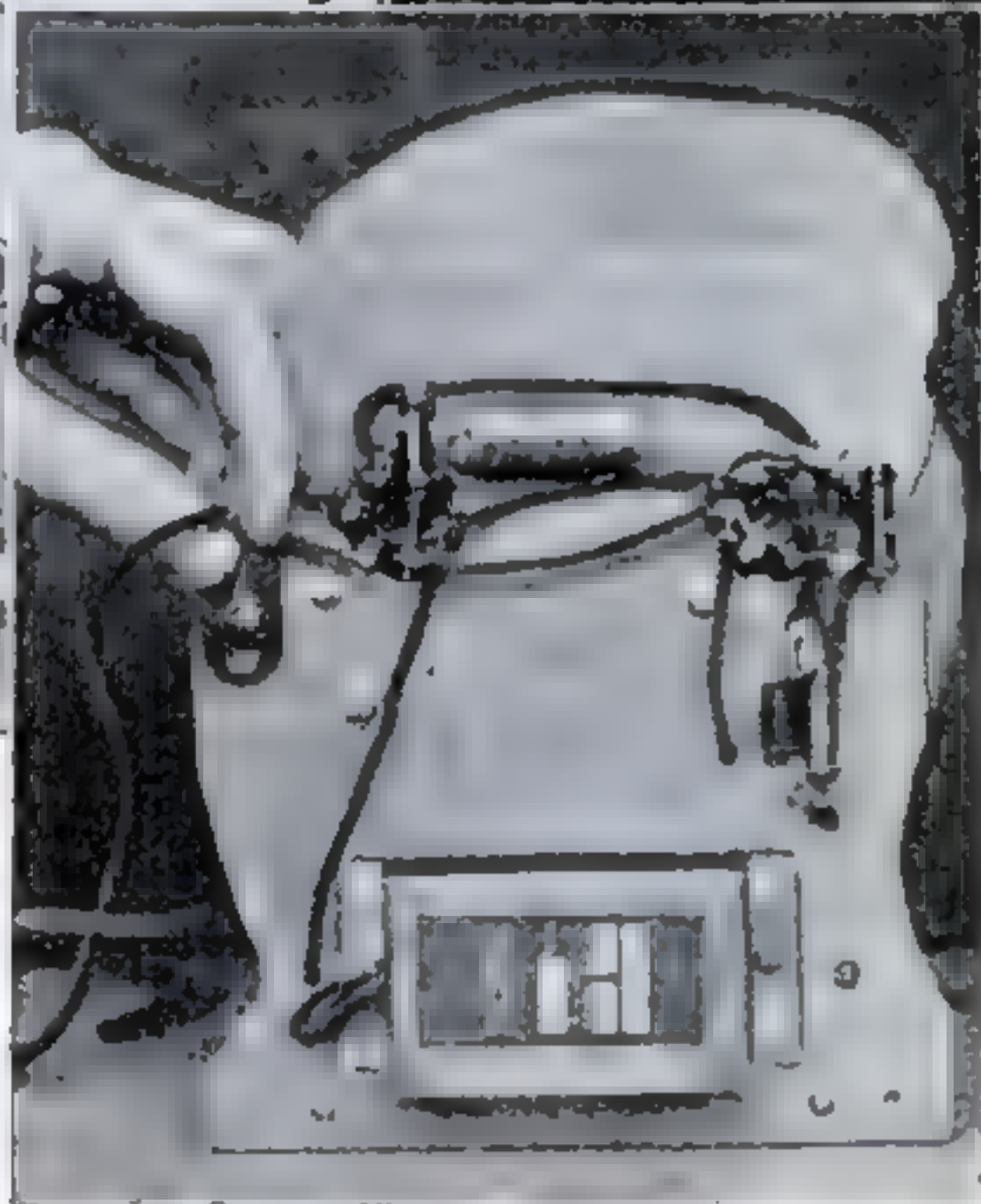
# This Radio "Winks" When You Tune It

By STANLEY JOHNSON

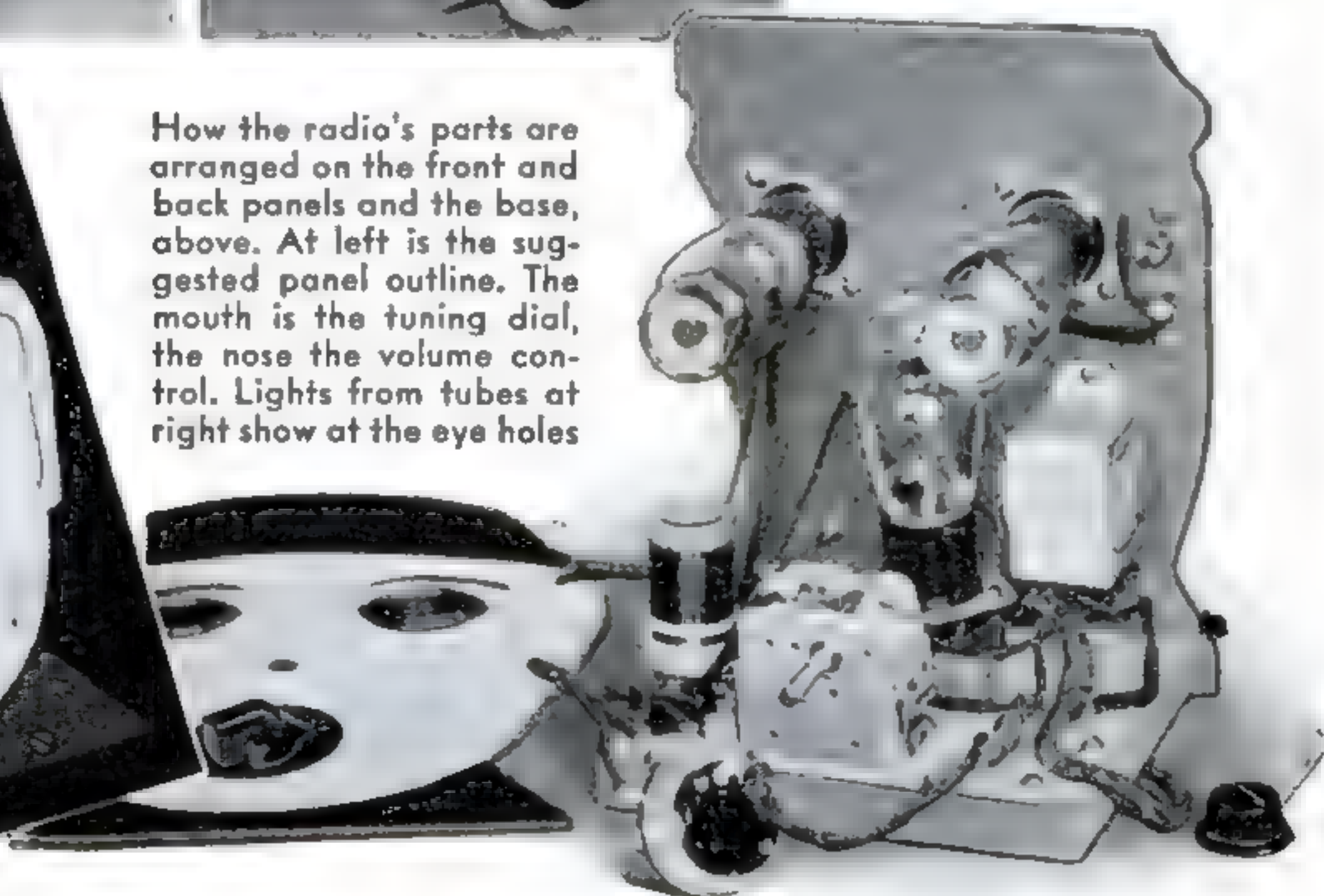
HERE is a receiver made to order for the radio fan who enjoys something novel. The three-tube, A.C.-D.C. circuit, which uses a minimum of parts and is easy to build, features two "tuning-eye" tubes, arranged on a facelike panel and so wired that one of the "eyes" closes to give the effect of a wink when the set is tuned to a station. An ideal playroom radio, it uses headphones so it cannot disturb the rest of the household. The chassis may be installed behind any "face" panel, the odd figure shown being merely a suggestion.

Operating head phones, the radio is an ideal playroom set

The set uses one 6N5 tuning-eye tube as a regenerative detector and the second as an audio amplifier. The 6N5, a new visual-tuning-indicator tube, operates satisfactorily on the 110-volt plate voltage available in an A.C.-D.C. (Continued on page 236)

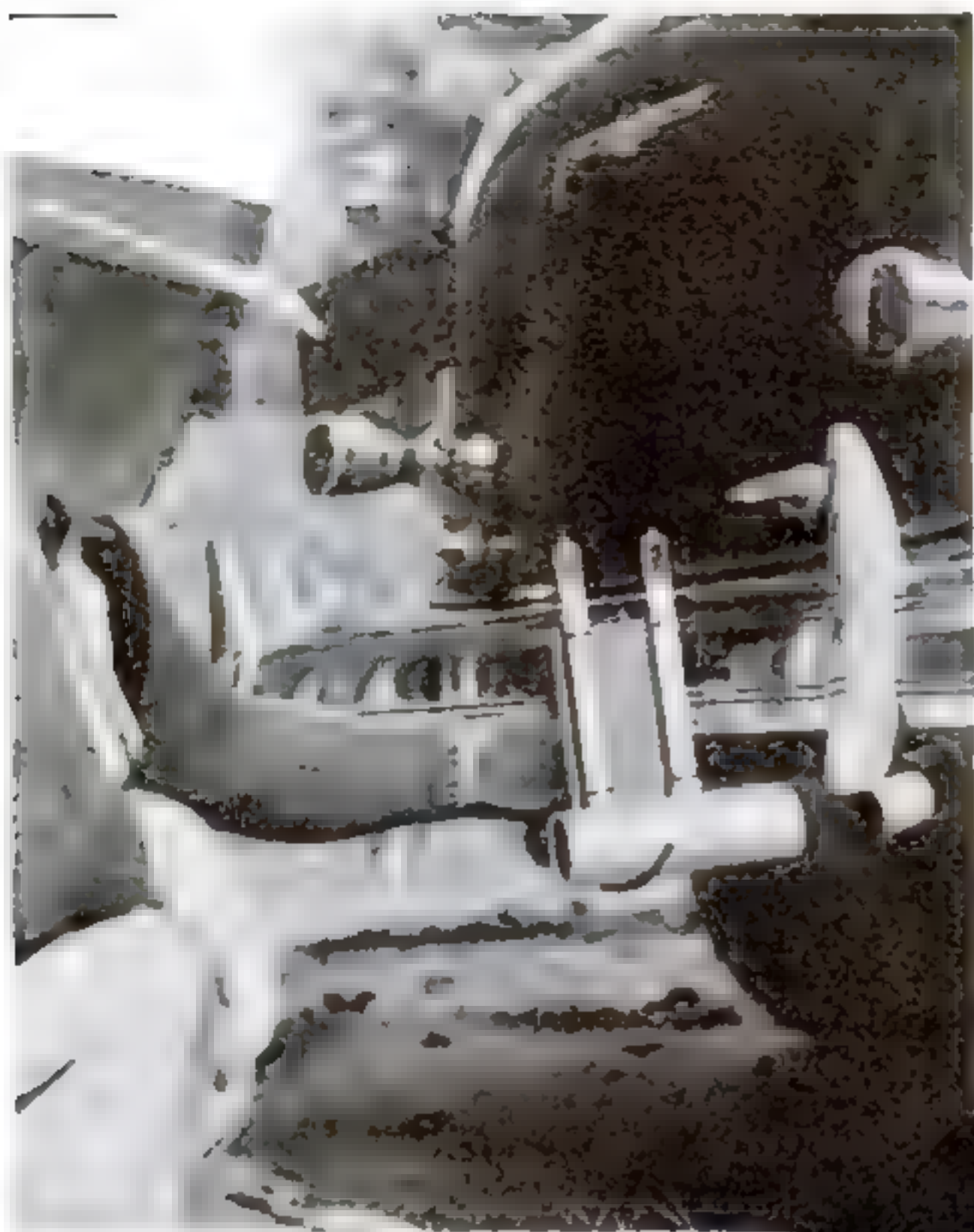


How the radio's parts are arranged on the front and back panels and the base, above. At left is the suggested panel outline. The mouth is the tuning dial, the nose the volume control. Lights from tubes at right show at the eye holes





# Car-Exhaust Analyzer for Motorists

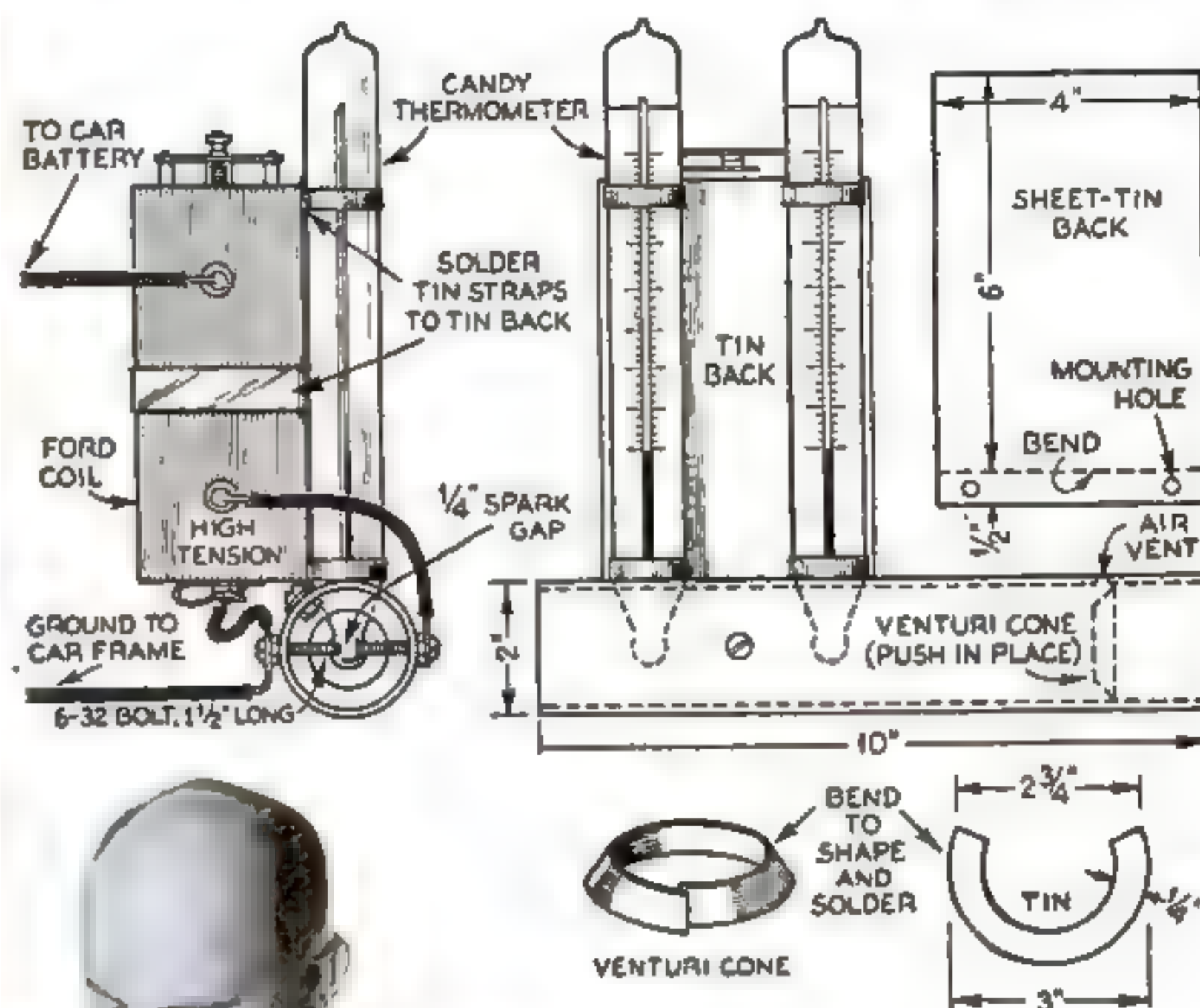


This exhaust analyzer helps you adjust your carburetor properly

**M**OTORISTS who aim for good gasoline mileage are careful to adjust their carburetors, but perfect adjustment is next to impossible unless you can analyze the exhaust gases coming from your engine. For a dollar or less you can make a simple but accurate analyzer that will let you put your carburetor into whack whenever you feel that adjustments are needed.

The device makes use of the carbon monoxide gas always present in the exhaust gases of a car. Carbon monoxide burns—if it gets enough air or oxygen. The analyzer described here supplies the oxygen, ignites the monoxide with an electric spark, and compares the temperature of the burned gas with that of the unburned gas from your exhaust. Since an efficient motor gives a minimum of carbon monoxide in the exhaust, the best carburetor adjustment is obtained when the temperatures of the burned and unburned gases are nearly equal.

Parts for the simple analyzer include a piece of sheet tin, a spark coil from a Model T Ford (an automobile junk yard can supply this), a 10" length of cardboard mailing tube, two thermometers of the type used in cooking candy, which you can get at a five-and-ten-cent store, a few nuts and bolts, and wire.



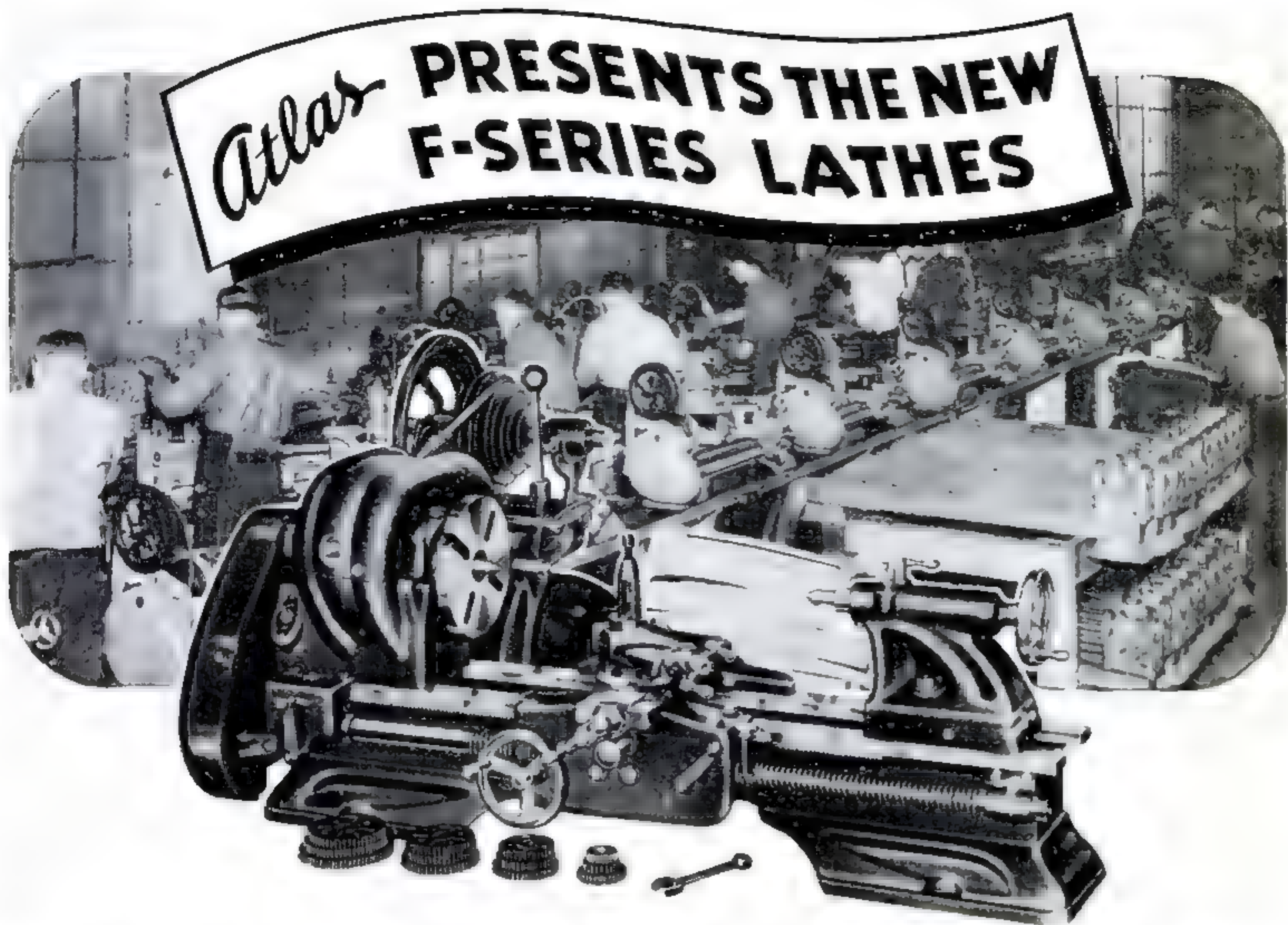
How the analyzer is assembled. Solder should be used to fasten the tin straps holding the coil and thermometers

The diagram above will assist you in building the device. First cut out the sheet-tin back and the venturi cone. The mailing tube, 2" in diameter, should be

drilled to admit the ends of the thermometers, and to take the two 1 1/2"-long, 6-32 bolts which form the spark gap. Insert the venturi in the mailing tube just ahead of the air vent to draw in the air. It is advisable to solder tin straps to the tin back to hold the spark coil and the thermometers.

Before using the analyzer, warm the engine thoroughly. Clamp the venturi end of the tube firmly over the exhaust pipe. Adjust the carburetor to make the mixture lean, until the engine runs unevenly. Now turn it back slowly until the engine runs smoothly and turn on the analyzer by connecting the wire to the car's battery. After ninety seconds, the rear thermometer will probably give a higher reading than the forward one. This shows that considerable carbon monoxide is present. Repeat the operations, always waiting ninety seconds before making new readings and turning off the spark between tests. When you have obtained the highest possible equal readings on the thermometers—about 130 degrees Fahrenheit—your carburetor will be in perfect adjustment.—A.K.





# THE ONLY POPULAR PRICED LATHE with ALL THESE MODERN FEATURES

## Power Cross Feed Standard Equipment

Now it can be told! Today Atlas dealers in all sections of the country are ready to show you the new Atlas F-Series Lathes, with one of the most outstanding developments in our 28 year history. Now, for the first time, you can have a *popular priced lathe with instantly reversible power cross feed and longitudinal feeds as standard equipment.*

It's the only lathe, too, with complete V-belt drive, quick-change countershafts, compact controls, precision ground bed ways, custom-built spindle bearings, extra power for heavy jobs, and many other modern features at the low price of \$104.75 for the 10" lathe with horizontal countershaft (complete as shown less motor) or \$99.75 for the vertical countershaft model.

Ask your dealer to show you the new Atlas and send today for the big new 1939 Atlas Catalog.

**SEE IT  
AT YOUR  
DEALER'S AND  
MAIL THIS  
COUPON**

### ATLAS PRESS CO.

155 N. Pitcher St., Kalamazoo, Mich.

Kindly send me your 1939 Catalog. I am interested in: ☐ New 10" Metal Lathes ☐ New Small Lathe ☐ New Shaper ☐ Drill Presses ☐ Arbor Presses ☐ Wood Lathes

Name .....

Address .....

City and State .....

## ATLAS PRESS CO.

NEW YORK  
130 W. 42nd St.

CHICAGO  
35 E. Wacker at Wabash

155 N. PITCHER ST.  
KALAMAZOO, MICH.

PHILADELPHIA  
113 N. Third St.



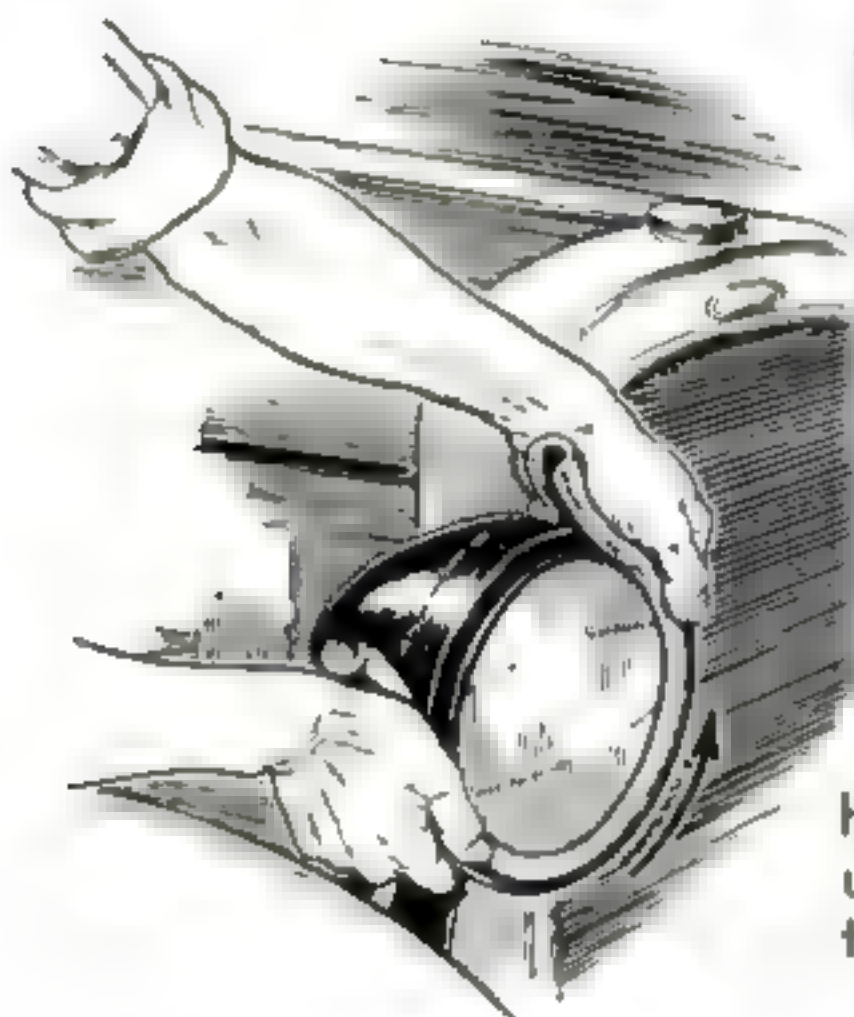
**LATHES · DRILL PRESSES · ARBOR PRESSES · SHAPERS**





## Helping a Driver To Back into a Parking Space

MOST persons who attempt to help a driver back into a crowded parking space stand on the curb and make a series of beckoning, traffic-cop gestures with their hands. A much better method, I have found, is for the helper to hold his hands approximately as far apart as the remaining distance between the backing car and the parked automobile behind, moving them together as the driver inches the car into place. In this way, the driver will be able to control his car more accurately, as he can regulate the movement with reference to the space available.—W.F.F.



How to prepare and use the handy grip to remove a lens

## Hose Grips Lens Holder

HEADLIGHT-LENS holders that are hard to remove can be started easily with an old scrap of garden hose about two thirds as long as the circumference of the lens. Slice off lengthwise the top third of the hose to form a channel as shown in the inset above. Placed along the lens rim, the hose provides a safe and efficient nonslipping grip with which to turn the lens.—A.H.W.

# KODAK



**KODAK SENIOR SIX-20 (f.4.5)**... Combination of body shutter release and eye-level finder offers new picture-making certainty . . . minimizes camera movement, catches the scene when it's exactly right. Kodak Anastigmat f.4.5 lens; 1/200 Kodamatic shutter. One-finger bed release. 2¼x3¼-inch pictures. **\$28**

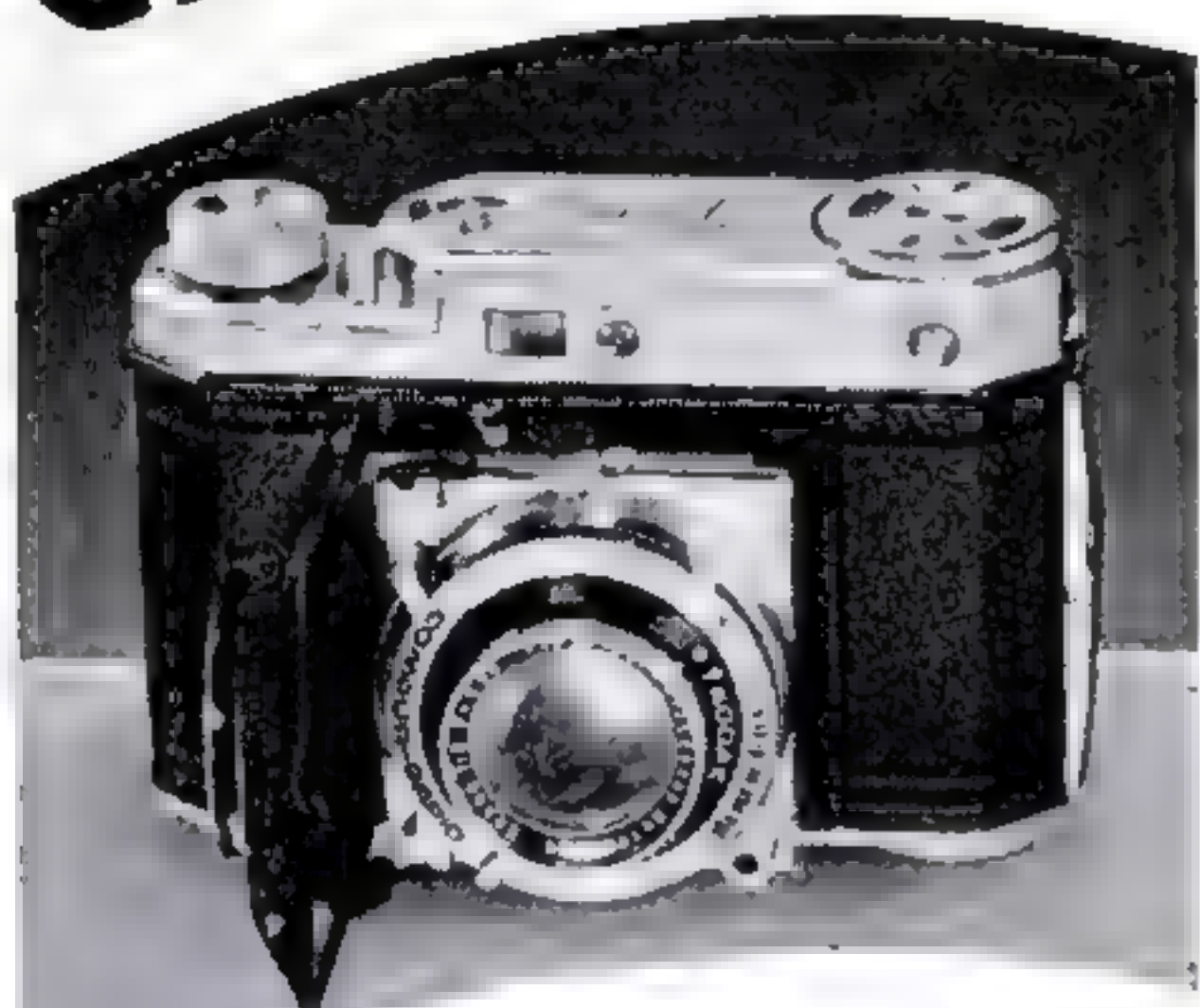


### CINE-KODAK EIGHT

"Economy" movie camera. Gives you 20 to 30 movie scenes of newsreel length on a roll of film costing \$2.25, black-and-white, *finished, ready to show*. Kodachrome (full-color) movies cost just a few cents more a scene. **\$32.50**



# CHRISTMAS CATALOG

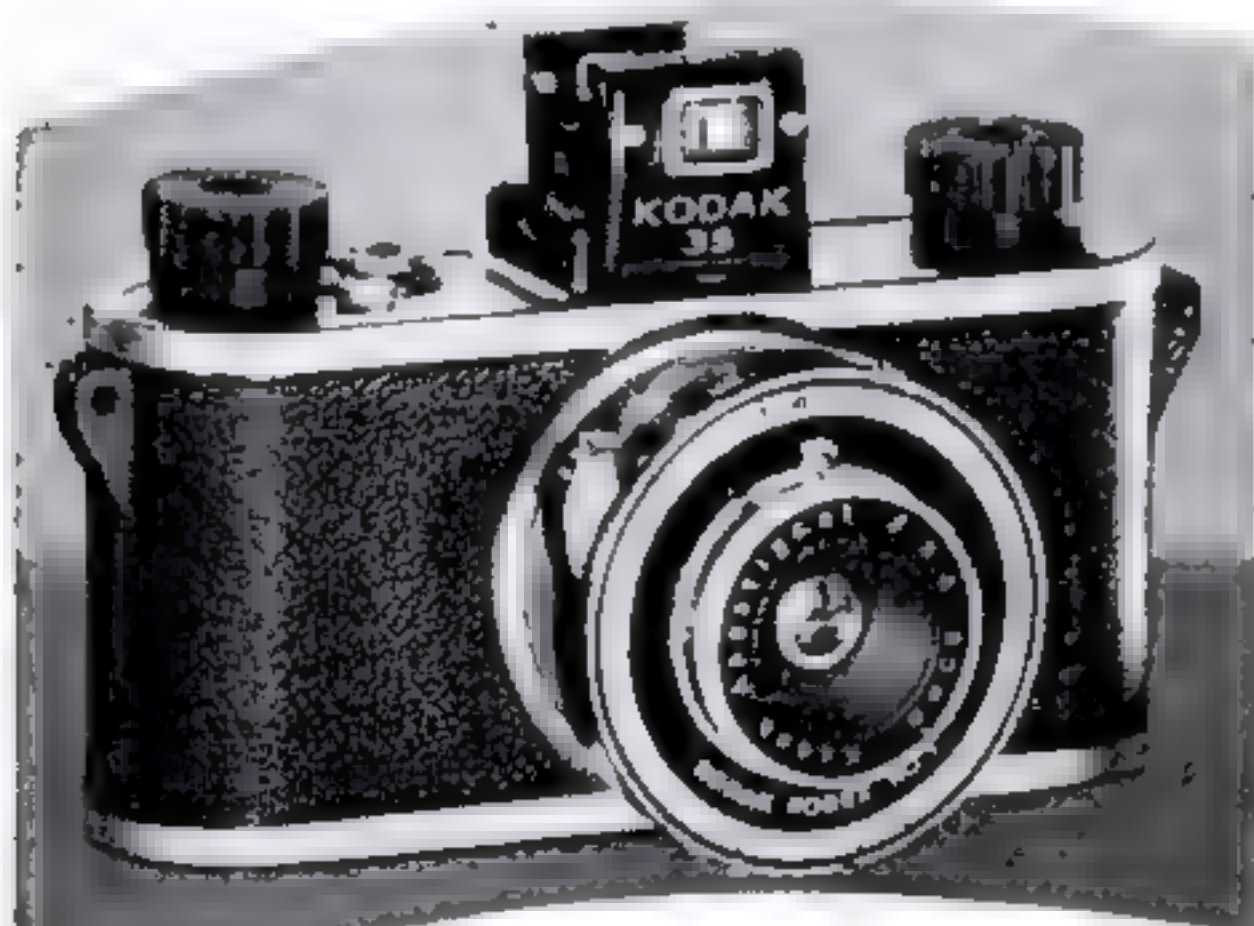


**KODAK RETINA II** (*left*) with anastigmat  $f.2.0$  lens. 1/500 Compur-Rapid shutter. Coupled range finder. Body shutter release. Price, \$140. Kodak Retina II,  $f.2.8$ , \$115. (Prices include sportsman's field case.) Both models load with a wide range of Kodak Film, including Kodachrome for gorgeous full color. **\$140**

**KODAK RETINA I** (*not illustrated*)...the original Retina, with Kodak Anastigmat EKTAR  $f.3.5$  lens. Shutter, 1/500 Compur-Rapid. Film-centering mechanism. Exposure counter. **\$48<sup>50</sup>**

**KODAK BANTAM SPECIAL** (*right*) Lens, Kodak Anastigmat EKTAR  $f.2.0$ —extra-fast, super-corrected. Shutter, 1/500 Compur-Rapid. Built-in military-type range finder linked with lens mount gives hairline focus instantly. Film-centering device locks film accurately in position for each exposure. New low price includes field case. **\$87<sup>50</sup>**

**KODAK BANTAM FAMILY** also includes Kodak Bantam  $f.4.5$  at \$27.50 and Kodak Bantam  $f.5.6$  at \$16.50. All three models load with full-color Kodachrome Film. Lower priced Kodak Bantams, for black-and-white pictures only, include the  $f.6.3$  model at \$9.50 and  $f.8$  model at \$4.75:



## NEW KODAK 35 FAMILY (*left*)

A really outstanding group of new precision miniature cameras that are priced impressively low. Fast lenses—fully corrected for color—and accurate shutters. For critical results in black-and-white, or full-color Kodachrome. Kodak 35, with  $f.5.6$  lens and 1/100 Kodex shutter (*illustrated*), \$18.50; with  $f.4.5$  lens and 1/150 Diomatic shutter, \$29.50; with Kodak Anastigmat Special  $f.3.5$  lens and 1/200 Kodamatic shutter, \$39.50. **\$18<sup>50</sup>**

BROWNIES FROM \$1—KODAKS FROM \$4.75—SEE THEM AT YOUR DEALER'S  
EASTMAN KODAK COMPANY, ROCHESTER, N. Y.

**Only EASTMAN makes the KODAK**



# CARBURETOR KAYWOODIE

Pat. No. 2,082,106

\$4



## To the Rescue

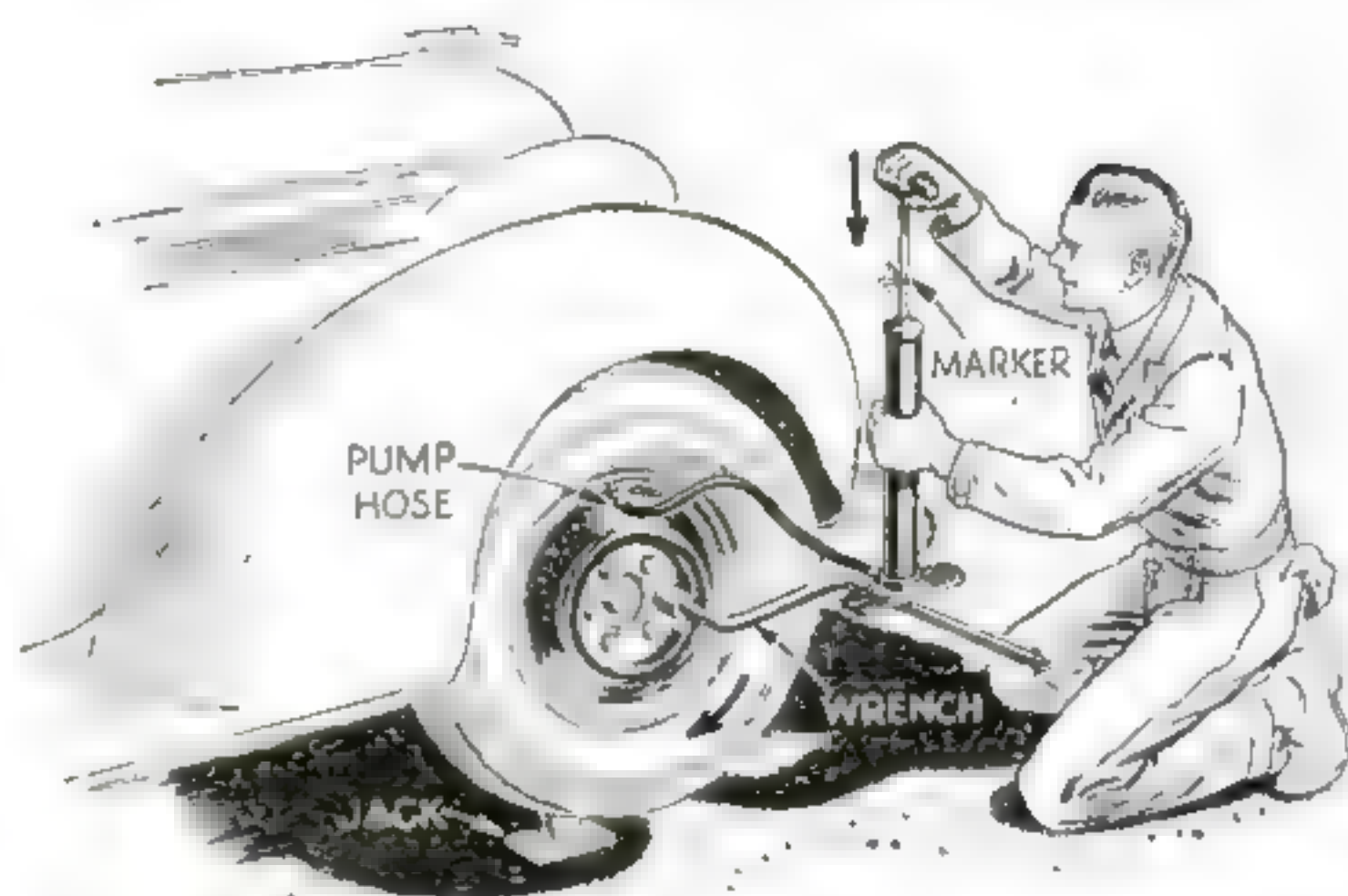
On busy days, some smokers puff so hard that their pipes, out of sheer sympathy, get pretty hot. To these men, that little carburetor in a Carburetor Kaywoodie comes to the rescue like spring water to a parched tongue. Yes, that little carburetor lets an *updraft* of air into the bowl, so that the harder you puff, the more air comes in, and instead of heating up, the smoke *stays cool*. Has brought new comfort to thousands of pipe smokers.

Shape pictured No. 71B, called DUBLIN (Long). Slightly less than actual size. Color: "Tobacco Brown," an exclusive Kaywoodie color.

Super Grain \$5, Flame Grain \$10, Meerschaum \$15, Matched-Grain Sets \$100 to \$1,000.

KAYWOODIE COMPANY  
Rockefeller Center, NEW YORK and LONDON

## Easy Test with Tire Pump Checks Brake Adjustment



MOTORISTS can make sure that all four brakes on a car are adjusted evenly by a simple method employing an ordinary tire pump and a piece of string. Connect the pump hose to the tire valve of a jacked-up wheel, with the base of the pump resting on a wheel wrench as shown, and press the pump handle down until the air pressure moves the wheel. Mark this spot on the pump rod with a piece of string. Then adjust the brakes on the other wheels so that the same pressure, as measured by the position of the string on the pump rod, will move each wheel.—T.W.B.

## Nozzle Deflects Exhaust



Vacuum-cleaner suction head set on exhaust pipe

TO PREVENT automobile exhaust fumes from discoloring the chrome finish on the rear bumper of my car, I attached the suction head of an old vacuum cleaner to the exhaust pipe to carry away gases from the engine. Because the head is well designed for air flow, there is no danger of back pressure on the exhaust line interfering with motor operation.—A.J.K.



# F I S H E R F A C T S

## ADVANCING the VALUE of the UNISTEEL BODY by FISHER

AT the dawn of each new automotive year, thousands look first to the new Body by Fisher as a guide to what's what in the advancement of motoring luxury and safety.

Quite naturally, this puts Fisher craftsmen face to face with an annual obligation. They can never "let well enough alone." They must be constantly improving, continually finding new ways to add new security, comforts and conveniences to the Unisteel Body by Fisher.

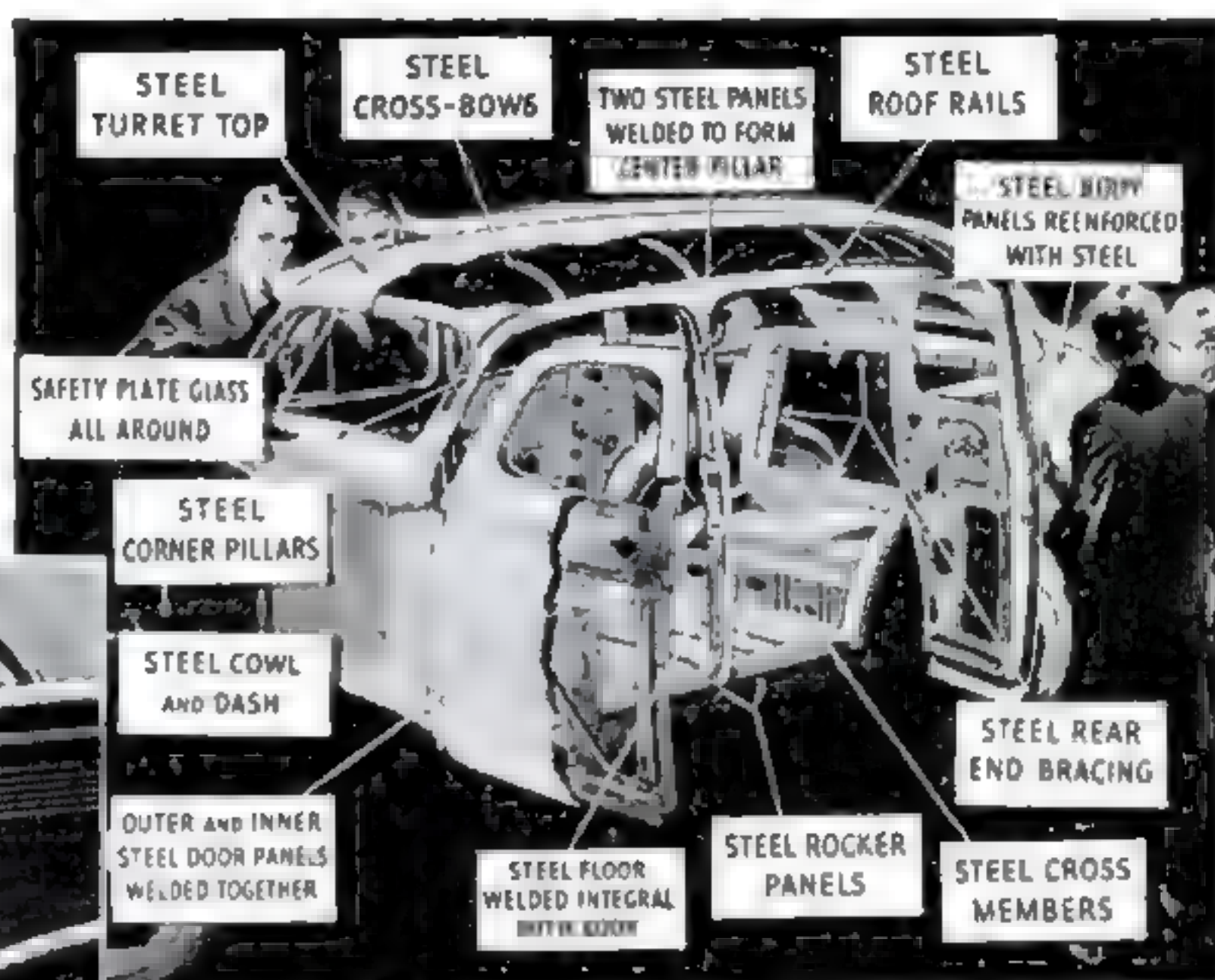
Just consider how faithfully they have followed this credo for 1939.

They have restyled the Unisteel Body by Fisher from cowl to tail-light with a new streamlined beauty that is now completely graceful, without one jarring note. They have enhanced the famed solid security of its Unisteel construction with more solid door supports and numerous other refinements; made its famous No Draft Ventilation even more



A SURE SIGN to car buyers of more safety, comfort and style for their money—the famed Body by Fisher emblem marks an even greater value in 1939, stamps all of the new General Motors cars as having every advantage, both familiar and new, that the world's most famous body craftsmen have contrived.

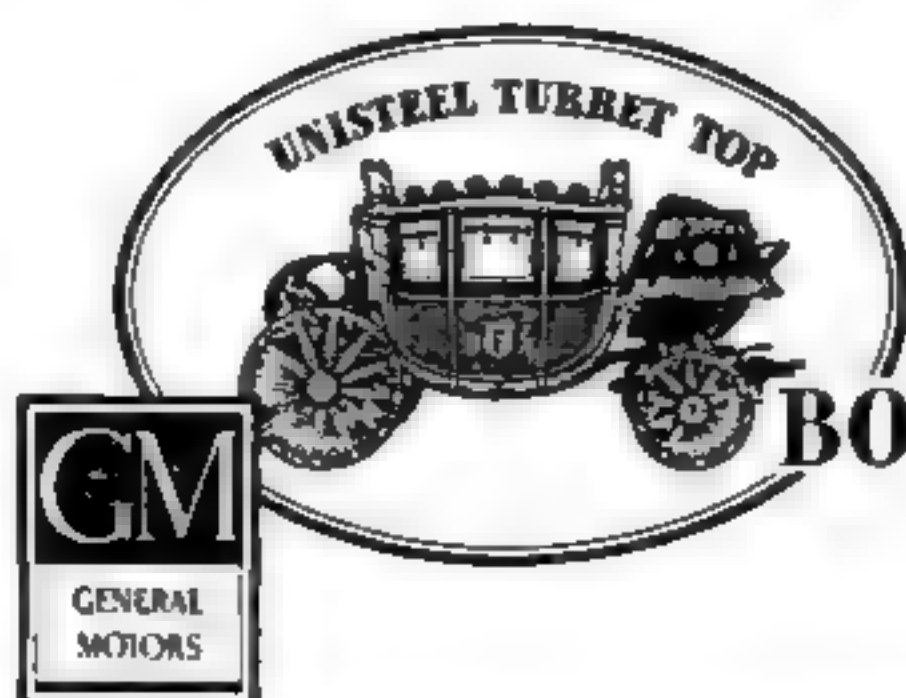
### "The Smart Buy of '39"



easily controllable, and added to safety by increasing its range of visibility.

In fact, throughout—from seamless Turret Top, through sound-, heat-, and cold-proofed insulated steel panels to solid steel floor—you'll find abundant new comforts, luxuries and greater safety in the new 1939 Unisteel Body by Fisher.

So there's more reason now than ever to "pick the car with Body by Fisher." It adds a new value to all General Motors cars—the only cars that have Unisteel Turret Top Body by Fisher.



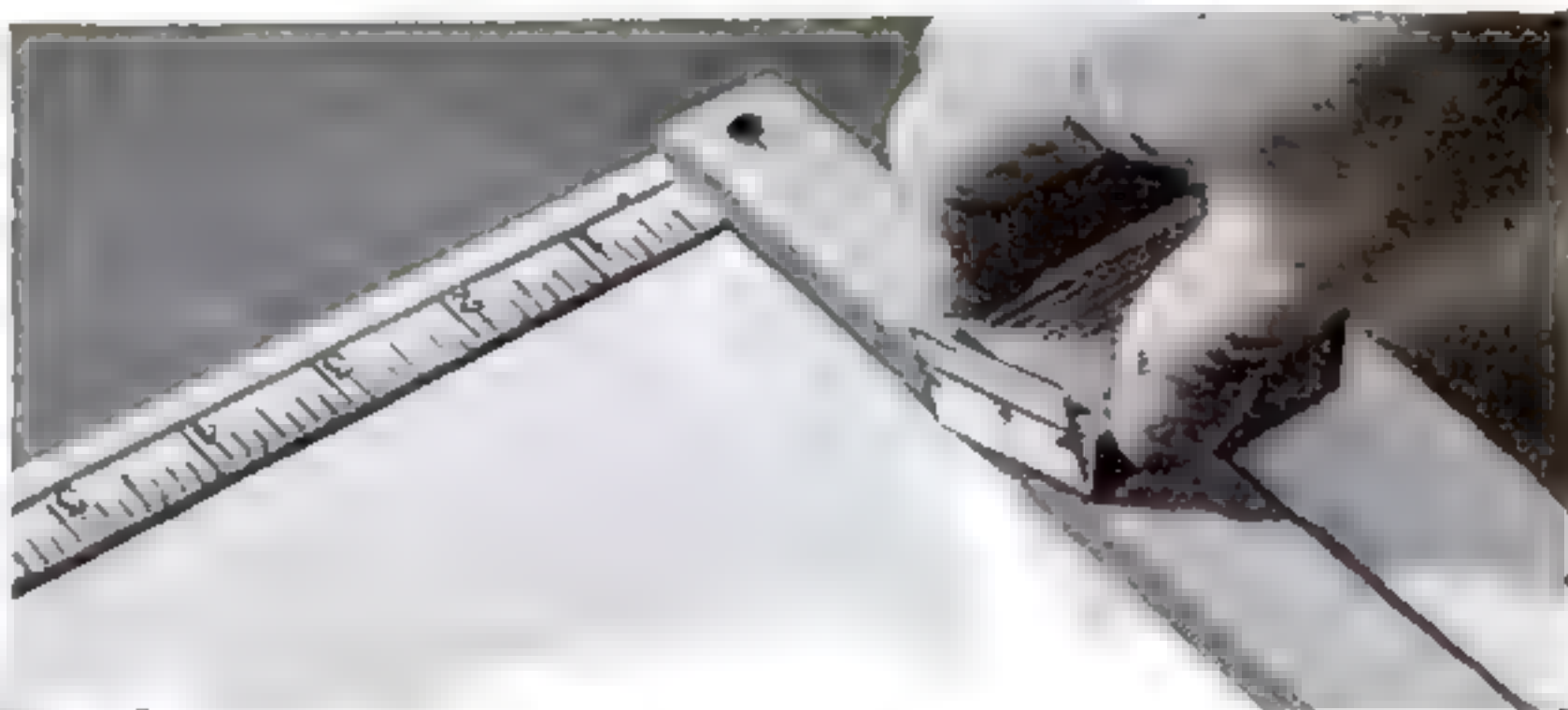
## BODY BY FISHER

ON GENERAL MOTORS CARS ONLY: CHEVROLET • PONTIAC • OLDSMOBILE • BUICK • LA SALLE • CADILLAC





## Razor-Blade Trimmer Cuts Photo Prints Accurately



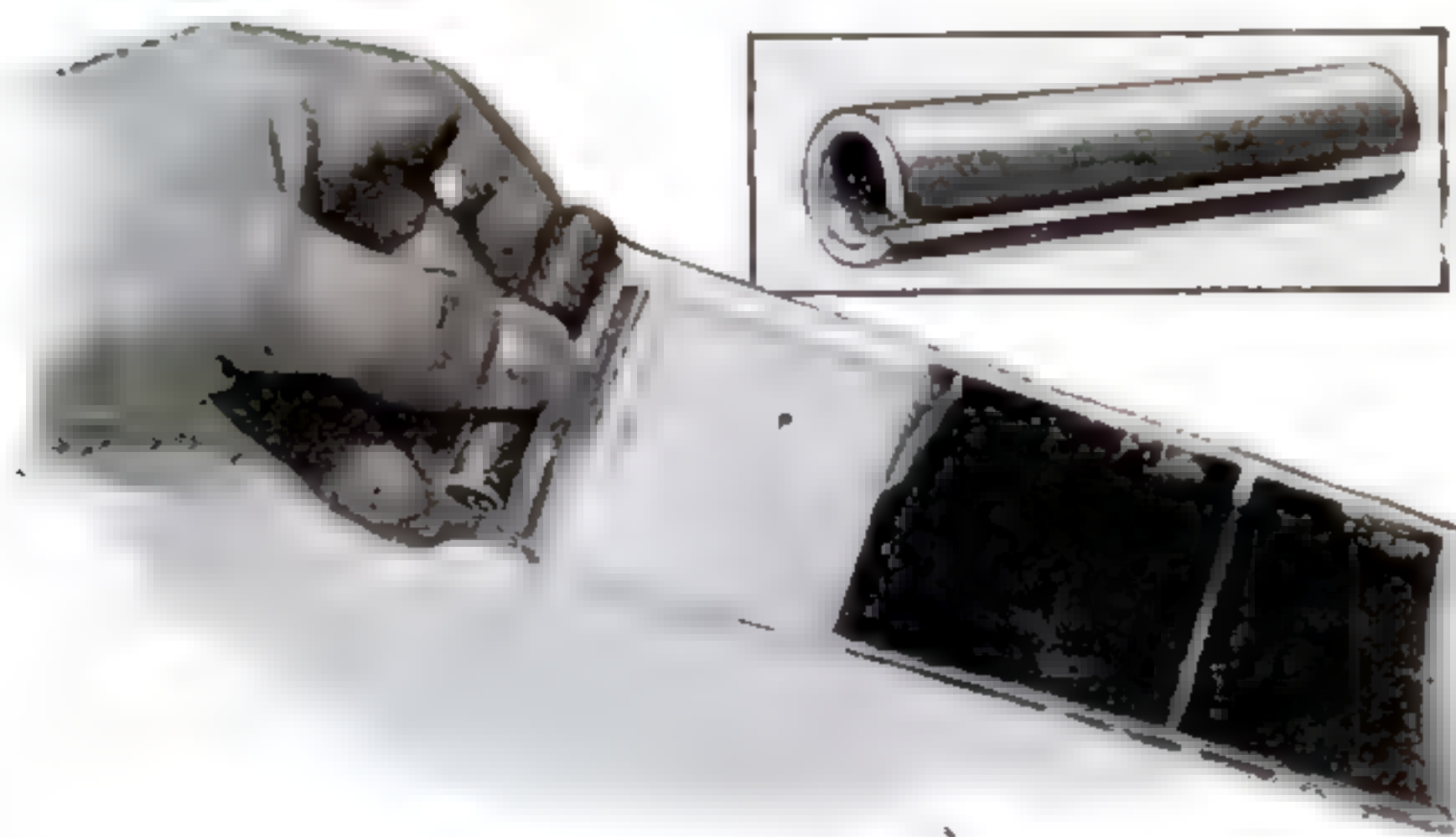
To use the trimmer, raise the cutting strip and insert the paper as at left. Replace the strip on the dowels and pull the block as shown above

**P**HOTOGRAPHIC prints and small sheets of paper, even if curled, can be cut accurately with the razor-blade trimmer illustrated. The board is of thick plywood with a ruler or yardstick fastened along one edge. A straight piece of  $\frac{1}{2}$ " by  $1\frac{1}{2}$ " wood is laid at right an-

gles to the end of the rule, and holes are drilled through each end into the base. Short dowels are glued in the holes in the base, and project far enough to hold the drilled strip in position. A small block is then rabbeted to slide on the strip, and the razor blade is attached to the block with a screw. The size of the plywood board depends, of course, upon the work to be handled. Protect the top of the blade with a piece of metal or wood so you won't cut yourself.—K.L.R.

## Slit Tubing Gives Firm Grip on Ends of Roll Film

**W**HEN roll films are developed in the tray by the seesaw method, the ends gripped by the fingers often become soft and slippery because of the melting of the emulsion. This can be avoided by cutting two short pieces of rubber tubing and slitting one side of each so that they will slip over the ends of the film and offer a firm grip.—C.L.



How the rubber tubes are cut, then slipped over the ends of the roll film and used as handles when developing in a tray



## Glossy Photos Spotted with Grease Pencil

**W**HITE spots on glossy photographic enlargements may be removed by spotting them carefully with a lithographer's pencil or "grease" pencil. It is easier to use than ordinary spotting colors, and the sheen matches the gloss of the paper much better.—J.G.R.



**NOW OWN THE  
GREATEST MINIATURE  
CAMERA EVER OFFERED  
AT SO LOW A PRICE!**

ONLY  
**\$25<sup>00</sup>**

**AUTOMATICALLY  
SETS POSITIVE  
FOCUS...WITHOUT  
LOWERING THE  
CAMERA FROM  
THE EYE!**

**AND LOOK!  
New! ARGUS MACRO  
ATTACHMENT**



ONLY  
**\$8<sup>75</sup>**

● For close-up photography of small objects... stamps, coins, flowers, seeds, insects, crystals, handwriting, fingerprints, physical features. (Designed for use with the ARGUS Speed Cameras, Model C and Model C2.)

Model C2



# THE NEW **argus** SPEED CAMERA

**WITH COUPLED RANGE  
FINDER...  
GUARANTEEING SHARP,  
IN-FOCUS PICTURES!**

● Eliminates readings, calculations, guesswork. Ends fuzzy, out-of-focus pictures. Fast f:3.5 CINTAR interchangeable lens; 1/5 to 1/300 sec. shutter speeds. Takes fast action shots, table-top shots, rainy day and night stage shots on 35 mm movie film... 18 or 36 exposures to one loading. (A penny a shot with bulk film.) Perfect enlargements. (If new to miniature photography values, remember NO GENUINE CANDID CAMERA can be had for less than the \$12.50 price of ARGUS Model A.)

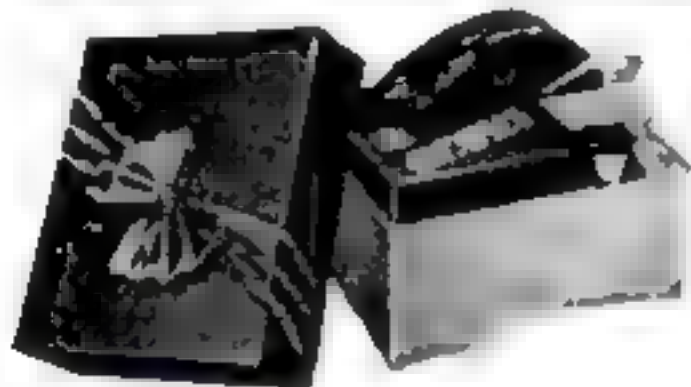
## **New! ARGUS Electromatic SPEED PRINTER MODEL EFA**

● The "Electromatic" eliminates all guesswork in timing, all fussing, focusing and paper trimming.

Uses ARGUS Bromex paper ready-cut to standard 2¾ x 4¼ size.

(Model EF offering similar advantages, except automatic timing, remains available at \$15.00.)

**New! ARGUS-Dufaycolor  
KIT...  
\$27<sup>50</sup>**



● Complete outfit for taking and showing life-size natural color photographs. Camera, Projector, Slide-Making Materials and Dufaycolor Film for 18 Pictures.



**\$35<sup>00</sup>**

**AUTOMATICALLY CONTROLS  
EXPOSURE TIME THROUGH  
PHOTOELECTRIC CELLS...  
PRODUCING PERFECT PRINTS  
OF UNIFORM QUALITY FROM  
ANY DENSITY OF NEGATIVE**

*At your dealer's, also see other  
ARGUS cameras and  
accessories.*

**INTERNATIONAL RESEARCH  
CORPORATION**  
266 Fourth St., Ann Arbor, Mich.

**CHECK THIS COUPON AND MAIL IT TODAY**

INTERNATIONAL RESEARCH CORPORATION  
266 Fourth Street, Ann Arbor, Michigan.

Please send catalog

☐ of all ARGUS Miniature Cameras.

☐ of fascinating accessories that make miniature photography a complete hobby.

Name \_\_\_\_\_

Address \_\_\_\_\_

City \_\_\_\_\_

State \_\_\_\_\_



# Don't miss on CHRISTMAS PICTURES

... get good clear photos  
with G-E Photoflash bulbs



Split-second flash gets vivid shots like this indoors or at night. And you are sure of *enough* light for good, clear pictures with all modern film. Easy to use. Operate on flashlight batteries or house current. Grand for color shots. Each lamp gets one picture. For holiday scenes you don't want to miss, use G-E MAZDA Photoflash lamps.

## FOR DOZENS OF SHOTS GET G-E PHOTOFLOODS

G-E MAZDA Photoflood lamps last for dozens of pictures. 2 G-E Photofloods in reflectors permit snapshots at night with box cameras and new super speed film. Great for home movies. Buy G-E MAZDA Photo lamps where you buy film.



For best results,  
read and follow simple directions on each package.



G-E MAZDA  
Photoflood lamps

No. 1 . . . 25¢ list  
No. 2 . . . 50¢ list



G-E MAZDA  
Photoflash lamps

No. 10 . . . 15¢ list  
Other sizes to fit your needs

**GENERAL ELECTRIC**  
MAZDA PHOTO LAMPS



## Low-Cost Tank Washes Roll Films Perfectly



A VERTICAL washer for roll films can be made for less than a dollar. For films  $2\frac{1}{4}$ " by  $4\frac{1}{4}$ " or smaller, a piece of  $4\frac{3}{8}$ " by 3" galvanized down spout 46" long is suitable. A 4" by 5" piece of galvanized sheet iron is soldered to one end, and this is fastened with copper nails to a wooden base. A  $\frac{1}{4}$ " hole is drilled about  $\frac{1}{2}$ " from the bottom so that a small spigot may be soldered in to serve as a drain. The intake is a short piece of copper tube soldered at an angle into a hole drilled  $3\frac{1}{4}$ " from the top. A weight at the bottom of the films being washed will keep them straight.—LOUIS SONKOY.

## Rope Pads Hold Tripod Points



TRIPOD points can be prevented from slipping on smooth surfaces by coiling three pieces of small rope into tight spiral pads and forcing a pin through the center to hold the turns in place. Moisten the pads to make them stick to the floor.—F.B.





# The Movie Camera That Couldn't Wait For Next Year!

## NEW 1939 MODEL "STOPS THE SHOW!" 60 GREAT NEW FEATURES MAKE FRONT PAGE NEWS!

Never before has a movie camera, at anywhere near this price, brought such perfection of detail . . . such simplicity of operation . . . such economy!

No wonder when it was previewed at the great International Camera Convention in Chicago, dealers said—"We want it now!" And so here it is—just in time for Xmas!

### Check Sensational Features!

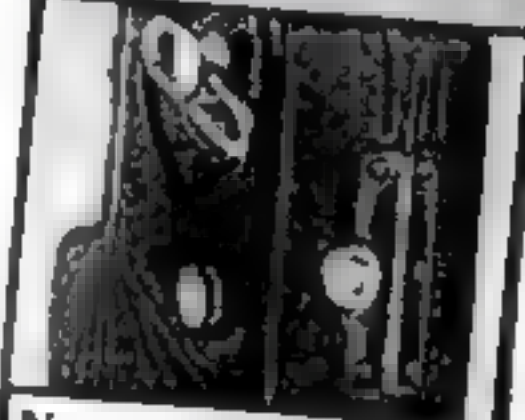
All America is talking about the new 1939 UniveX! Its magnificent new styling . . . its amazing performance . . . its 60 great features that you'd expect to find only in a high-priced camera! New built-in optical view-finder . . . new improved governor . . . new automatic shutter . . . new snap-lock hinged cover! Improved F 5.6 lens, instantly interchangeable. New quiet, powerful, smooth-running spring motor.

Just think—the new 1939 UniveX has all these important features—and many more! And, in addition, it's the only camera in the world that takes sharp, clear movies at less cost than snapshots! (UniveX Ciné film-roll costs only 69¢.)

**DON'T DELAY!** Know the thrill of taking living action pictures of your family and friends—movies you'll cherish all your life! See the new 1939 UniveX Ciné "8" at your dealer's today before his limited supply is exhausted.

**Universal Camera Corporation**  
New York • Chicago • Hollywood

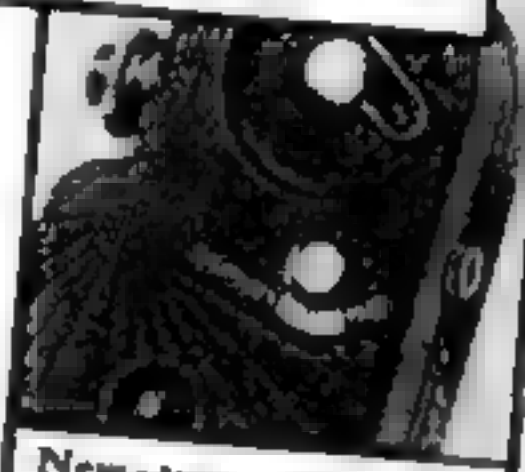
Features Like These Found Only in High-Priced Cameras!



New built-in optical view-finder insures getting exactly what you see



New re-designed loading mechanism. Self-locking hinged cover simplifies loading; makes film jamming impossible



New-type, quiet-running powerful motor. Automatic self-capping shutter. Automatic footage indicator.



**\$12.50**

Price Higher Outside U.S.A.

## Sensational New Guarantee Insures Your Movies!

For the first time, a movie camera makes this guarantee: "Satisfactory movies if instructions are followed or a new roll of film free." This is your proof that it is possible for a \$12.50 camera to get perfect results!

# NEW 1939 UniveX CINE "8"

### UNIVERSAL CAMERA CORP.

Dept. 214, New York City

Send me illustrated booklet "INSURED MOVIES," which describes the New 1939 UniveX Ciné "8" and its sensational guarantee.

### FREE BOOKLET

NAME \_\_\_\_\_

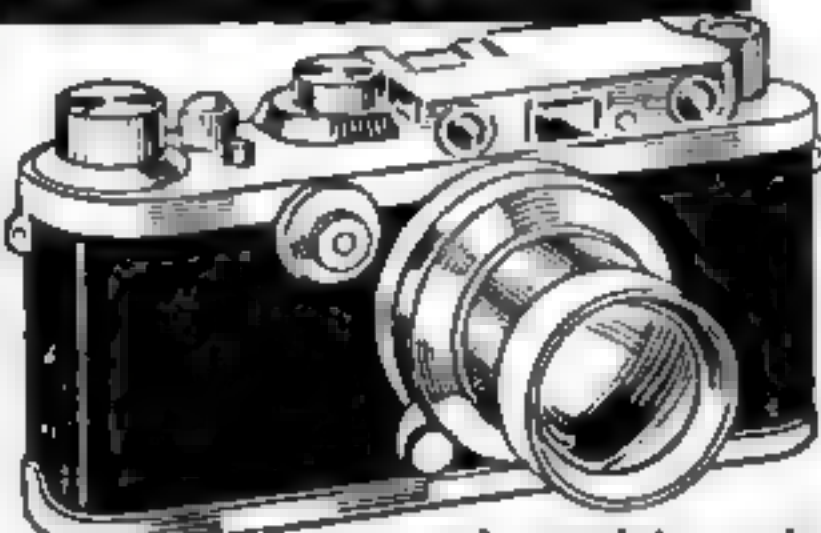
ADDRESS \_\_\_\_\_

CITY \_\_\_\_\_

STATE \_\_\_\_\_

## FREE

## CAMERA BOOK!



Illustrates latest developments in photography and Home Movie Making, for fun and profit. Offers hundreds of new and used still, movie cameras, lenses, films, exposure meters, enlargers, darkroom supplies—everything photographic. All guaranteed—many at big savings. Central offers you America's

most complete, varied stock of foreign and domestic merchandise from world's leading makers: Eastman Kodak, Zeiss, Bell & Howell, Graflex, Geveart, Korona, Bausch & Lomb, etc. **SAVE** at Central! Satisfaction guaranteed or money back. We take your old camera and equipment in trade. Write for Free camera book

**CENTRAL CAMERA CO., 230 S. WABASH**  
Dept. 1-S, CHICAGO, U.S.A.

**PHOTOGRAPHIC HEADQUARTERS since 1899**

WRITE TO



FOR HIS BOOK OF BARGAINS

### ORDER FROM THIS LIST OF BASS GUARANTEED BARGAINS

- **ELWOOD ENLARGER**—takes negatives 2 1/4 x 3 1/4 or smaller.....\$22.50
- **SUPER SPORT DOLLY**—built-in range finder, 16 or 12 shots on 120 film, Xenon f:2.8 lens, Compur B List \$65 .....\$52.50
- **Voigtlander Superb Reflex**: Skopar F:3.5 lens, Compur shutter.....\$59.50
- **CANDID MIDGET**—F:4.5 Hugo Meyer lens, Vario shutter to 1/100 sec.....\$19.50

Write Dept. PS

**BASS CAMERA COMPANY**

179 W. Madison St.

Chicago, Ill.



## YOUR CAMERA CAN DO AS WELL



**Y**OU too, can take clear, sparkling snow pictures. Just try a few snap shots with the help of the G-E exposure meter. You'll see what a difference *correct exposure* makes in the finished print. Now there's no reason for wasting film or losing the record of your favorite scenes. You'll get each picture easily, quickly.

You can use the G-E meter for stills or movies—in black and white or full color. Then, too, you can determine the correct time for printing or enlarging—or check light values in your home or office. Ask your dealer to show you the versatile G-E exposure meter. General Electric Company, Schenectady, N.Y.

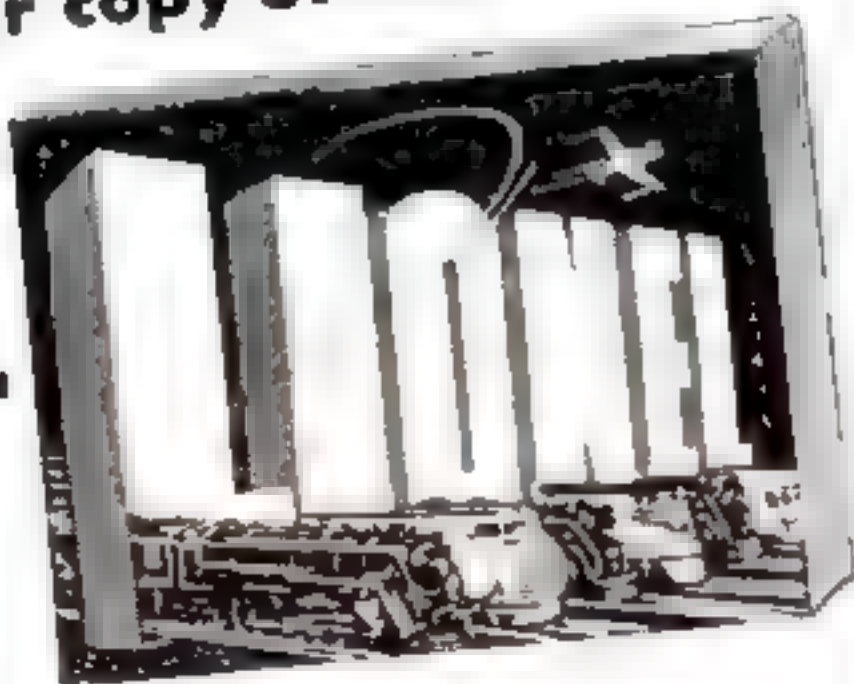
**GENERAL  ELECTRIC**

430-124F1

## IT'S NOT TOO LATE

To get your copy of the 52-page

**1938  
LIONEL  
catalog**



• Write at once for your copy of this big, full-color book of railroading—and you will receive it by mail, in plenty of time to make your selection from the 1938 Lionel fleet of speed wizards—the only trains in the world with electric whistling, uncoupling, loading, unloading and reversing. Act at once!

The Lionel Corporation Dept. BJ  
15 East 26th Street, New York, N. Y.  
Enclosed is 10 cents for a copy of the new 1938 52-page, full color Lionel Catalog. Send it to:

Name \_\_\_\_\_

Address \_\_\_\_\_

City \_\_\_\_\_ State \_\_\_\_\_



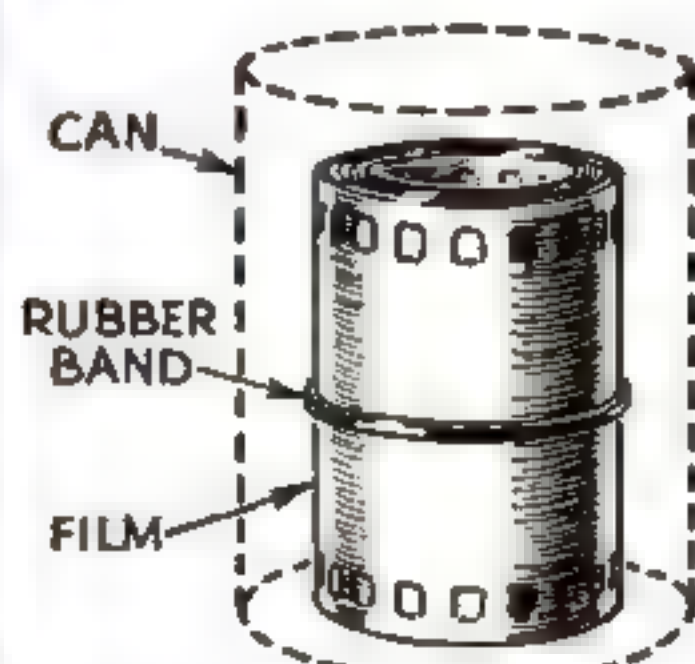
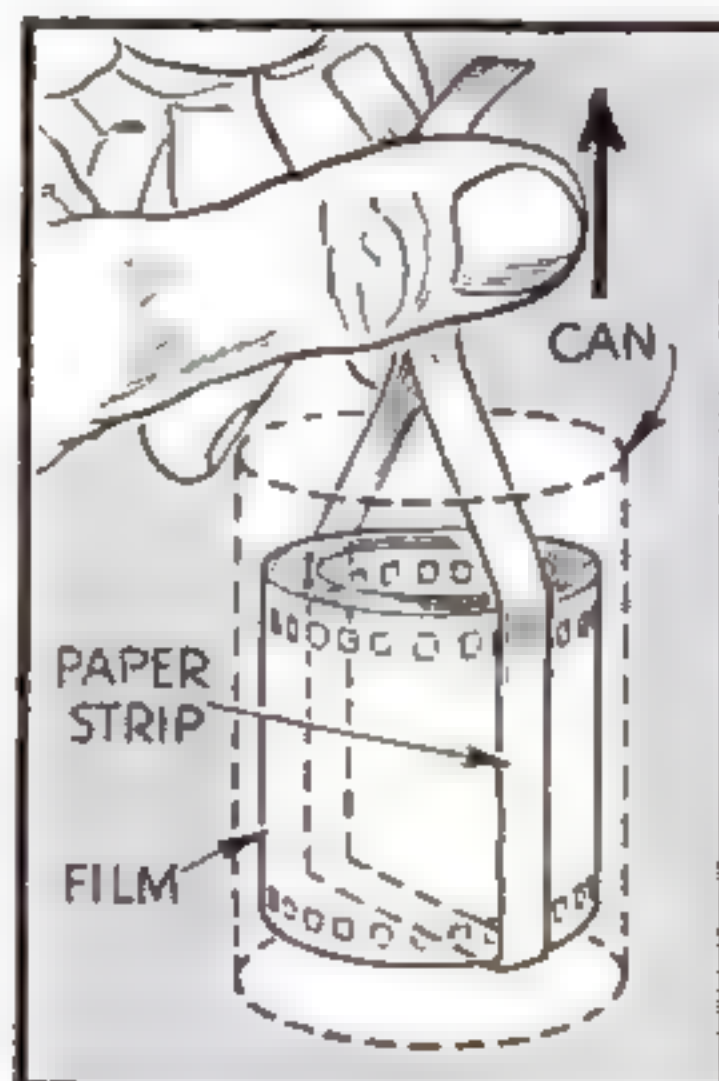
## Hypo Measured Quickly in Ice-Cream Carton

IF THE only scales available in the photographic darkroom are ordinary photo scales, considerable time can be saved in measuring 8 oz. or 1 lb. of hypo crystals by making a measure from a small round carton such as is often used for ice cream. The bottom of the carton is pushed up so that the desired quantity of hypo will come level with the top. Cement the bottom in place at this point, and thereafter simply fill the container level when making up your new fixing solutions.—O.B.

## Storing Miniature Negatives in the Original Cans

A STRIP of paper  $\frac{3}{4}$ " by 7", if placed end-wise about a roll of 35-mm. double-frame negatives, will protect them from being scratched when they are filed away in the original containers. Let the excess paper project to form a tab for lifting out the roll. Another convenient way to fill and empty the film cans is to roll the negatives tightly and bind with a rubber band. Always hold 35-mm. negatives by the edges to prevent

finger prints, and never twist the roll tight because this may scratch the film's emulsion.—  
A. C. FLACKBERT.





**FREE  
CAMERA  
CATALOG**

## SENSATIONAL BARGAINS IN CAMERAS, FILMS AND SUPPLIES

The catalog that saves you REAL money! Latest type cameras, films, supplies, accessories—famous names—everything you need in photography—at prices you can't beat anywhere. Write today for your FREE copy of Camera Catalog No. 72.

**WHOLESALE RADIO SERVICE CO., INC.**  
Dept. BAC—100 Sixth Ave., New York, N. Y.

## PHOTO ENLARGEMENTS

**5¢**

Is Photography your hobby? Do you want a profitable easy business at home? Make **PHOTO ENLARGEMENTS** for yourself and others. Your cost 5c each and less. The Ideal Photo Enlarger is **AUTOMATIC**. No experience required. Also **COPIES** any picture \$5.94 **COMPLETE**. Interesting circular **FREE**.

**IDEAL-X, 122 East 25th Street, NEW YORK**

## YOUR OWN MOVIES! 10¢ A DAY!

**NATIONALLY ADVERTISED 8MM and 16MM Movie cameras, projectors.** For home, business, church, school, club. **MONEY BACK 10 DAY TRIAL.** Payments as low as 10¢ A DAY. Satisfied customers throughout the world. **FREE details. WRITE TODAY.** Ben Elder's Home Movies, Dept. C-1, 729 Baystate St., Boston, Mass.

## IT'S FUN TO ASSEMBLE and operate your own MARIONETTES



You will enjoy assembling this lifelike, performing marionette of Walt Disney's amusing character, *Dopey*.

### New Kit Makes It EASY

Everything you need to assemble a fascinating 9-inch marionette of Dopey, now comes to you in this new complete kit. Can be completely put together by anyone in 15 minutes with the easy-to-follow instructions included. Dopey walks, turns his head, bows, moves his hands and feet, and goes through all the amusing antics of the famous screen character. You control every movement with the simplified controller included with every kit. Attractively boxed, makes an ideal gift.

#### EACH KIT CONTAINS

Completely finished hand-painted head, finished arms, hands, body, and feet. Ready-made blue pantaloons, orange coat and belt. New simplified control stick, wire, thread and complete instructions. Nothing else needed. Simply assemble and operate. It's lots of fun for every member of the family.

#### SEND NO MONEY

Just mail the coupon below and pay the postman only \$2.25 plus a few cents postage in full payment when the kit is delivered. You risk nothing because if you are dissatisfied after examining the kit, we will refund your money in full if you return it within 10 days.

### MAIL THIS COUPON TODAY

**POPULAR SCIENCE MONTHLY, Dept. 19**  
353 FOURTH AVE., NEW YORK, N. Y.

Please send me a complete marionette kit for assembling Dopey. I will pay the postman \$2.25 plus a few cents postage on delivery. You will refund what I have paid if I return the kit within 10 days.

NAME.....

ADDRESS.....

CITY.....STATE.....

If you prefer to remit now, we pay postage east of the Mississippi. Add 25c for shipment to farther points.

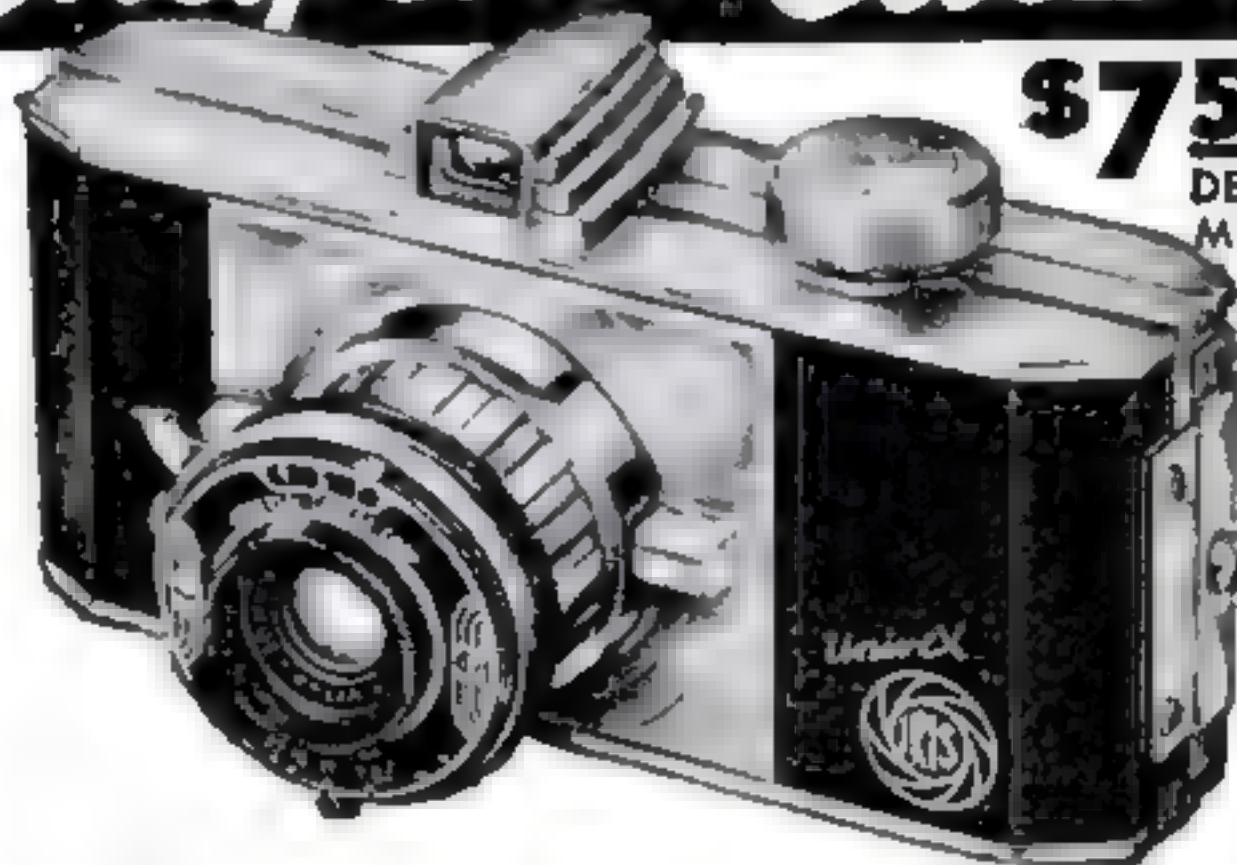


## NOW! SHOW YOUR COLOR SLIDES

**WITHOUT PROJECTION, SCREEN, OR DARKENED ROOM** Enjoy bright, sharp, enlarged views of your miniature film slides, black and white or color, without the fuss or bother of projection. Use the new Bausch & Lomb Film Slide Viewer, in handsome bakelite, black, brown or green. Ideal gift for mini fan. At your dealer's, or write for free folder. **\$8.50**

**BAUSCH & LOMB**  
289 BAUSCH STREET ROCHESTER N. Y.

## GET OUT OF THE "Snapshot Class!"



**\$7.50**  
DE LUXE  
MODEL

**FEATURES: LENS**—Vitar f:7.9 color corrected. **SHUTTER**—Three speeds, instantaneous, time and bulb. Iris diaphragm with four stops, f:7.9, 11, 16, 22. **CONSTRUCTION**—Precision shutter in chromium collapsible mount. **CASE**—Die-cast alloy (all metal, no plastics). Hinged back for quick loading. **VIEW FINDER**—Optical, precision type with minimum parallax error. **PICTURE SIZE**—1½"x1½" Enlarges beautifully. **FILM ECONOMY!** Only candid camera that uses fast UniveX 15¢ ULTRAPAN Film. Standard Model, Satin Black Finish with Chromium Trim.. \$5.95

Free Iris Booklet. Dept. 287  
Universal Camera Corp., New York

Prices Higher Outside U.S.A.

### XMAS GIFT BOX

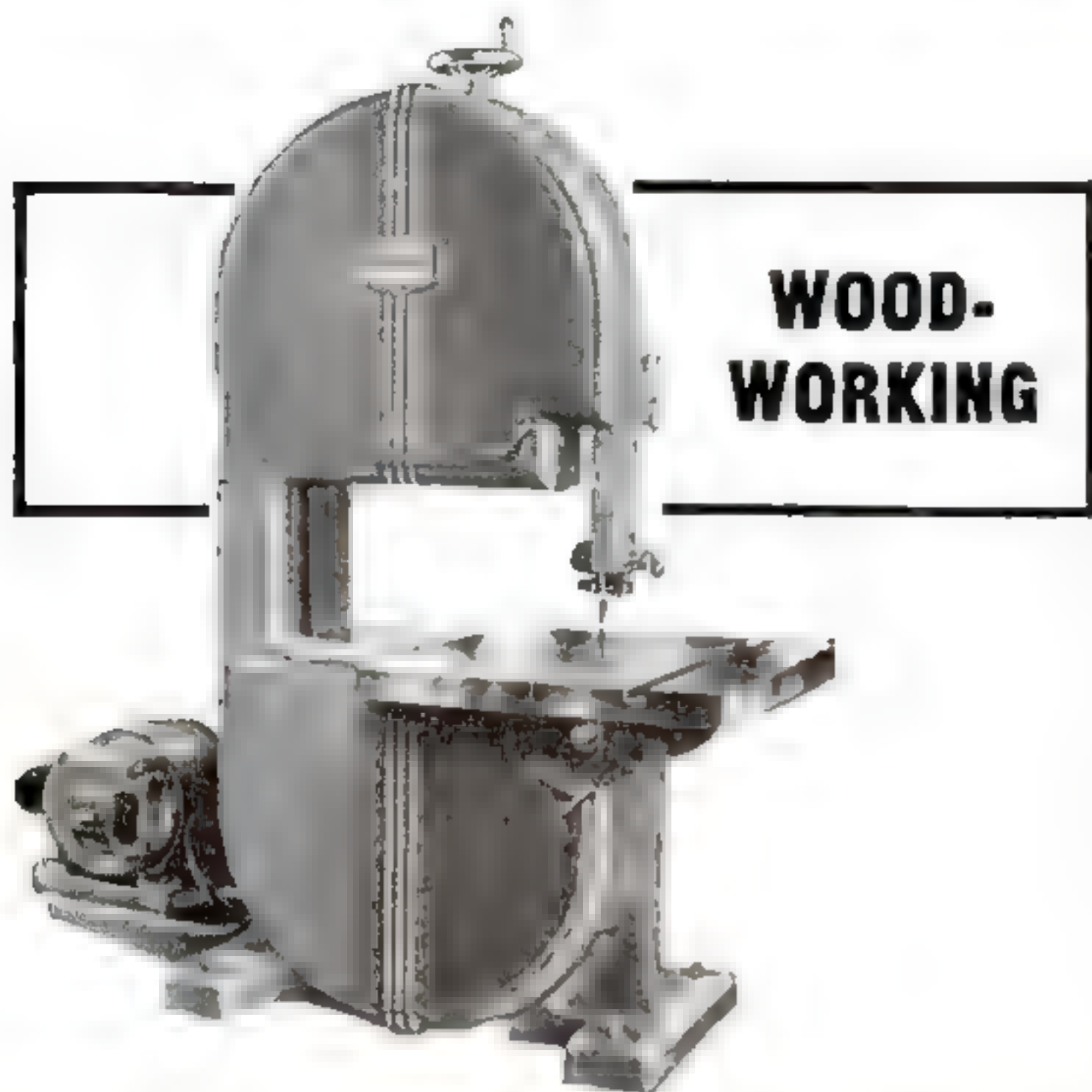
Contains new 1939 UniveX Iris De Luxe Candid Camera; handsome, rich, brown grained-finish, suede-lined Camera Case; and **\$9.85** cable release.

**UniveX IRIS**

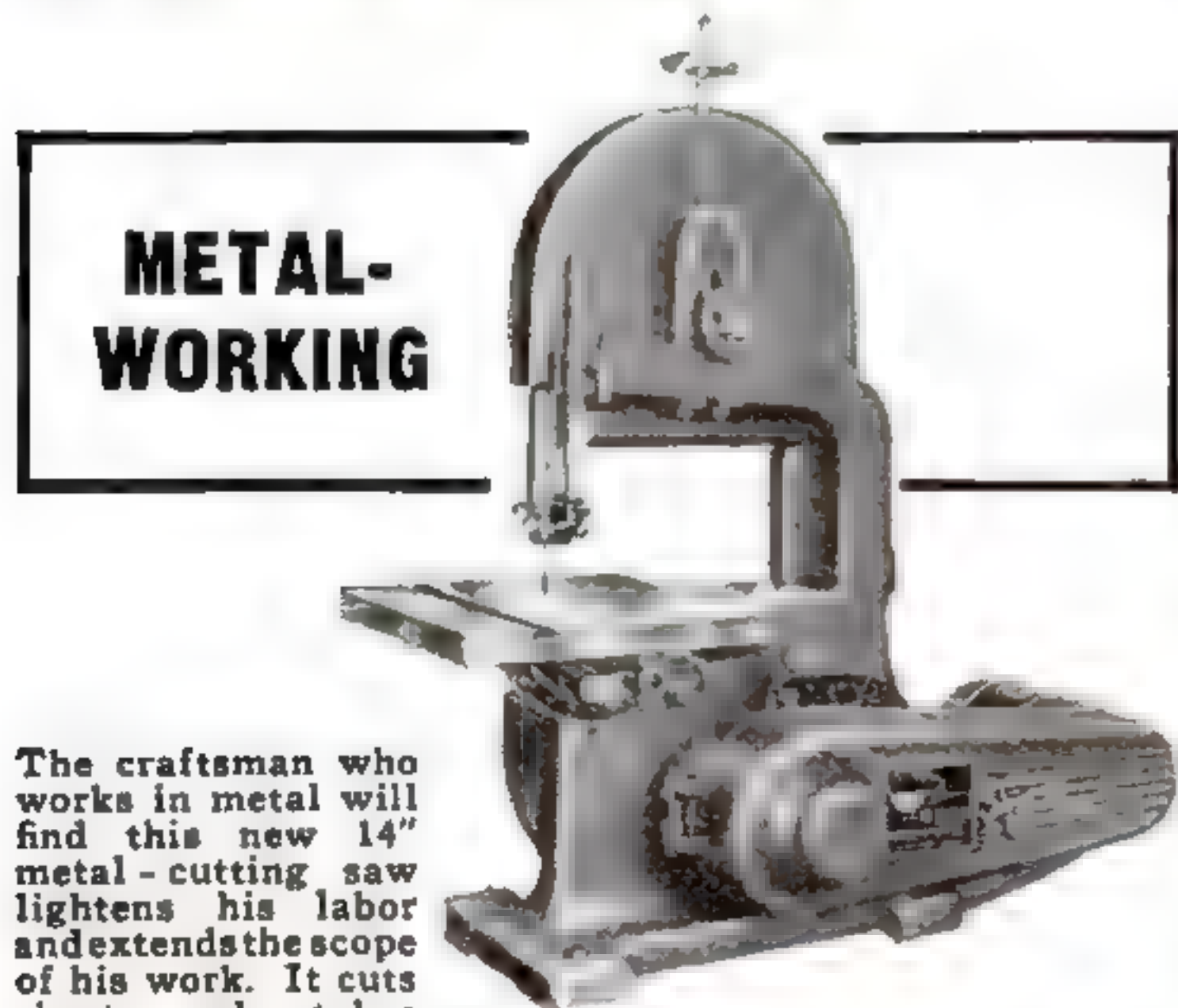


# 2 NEW BAND SAWS

PERFECTED FROM DRIVER'S  
EXPERIENCE IN BUILDING 50,000!



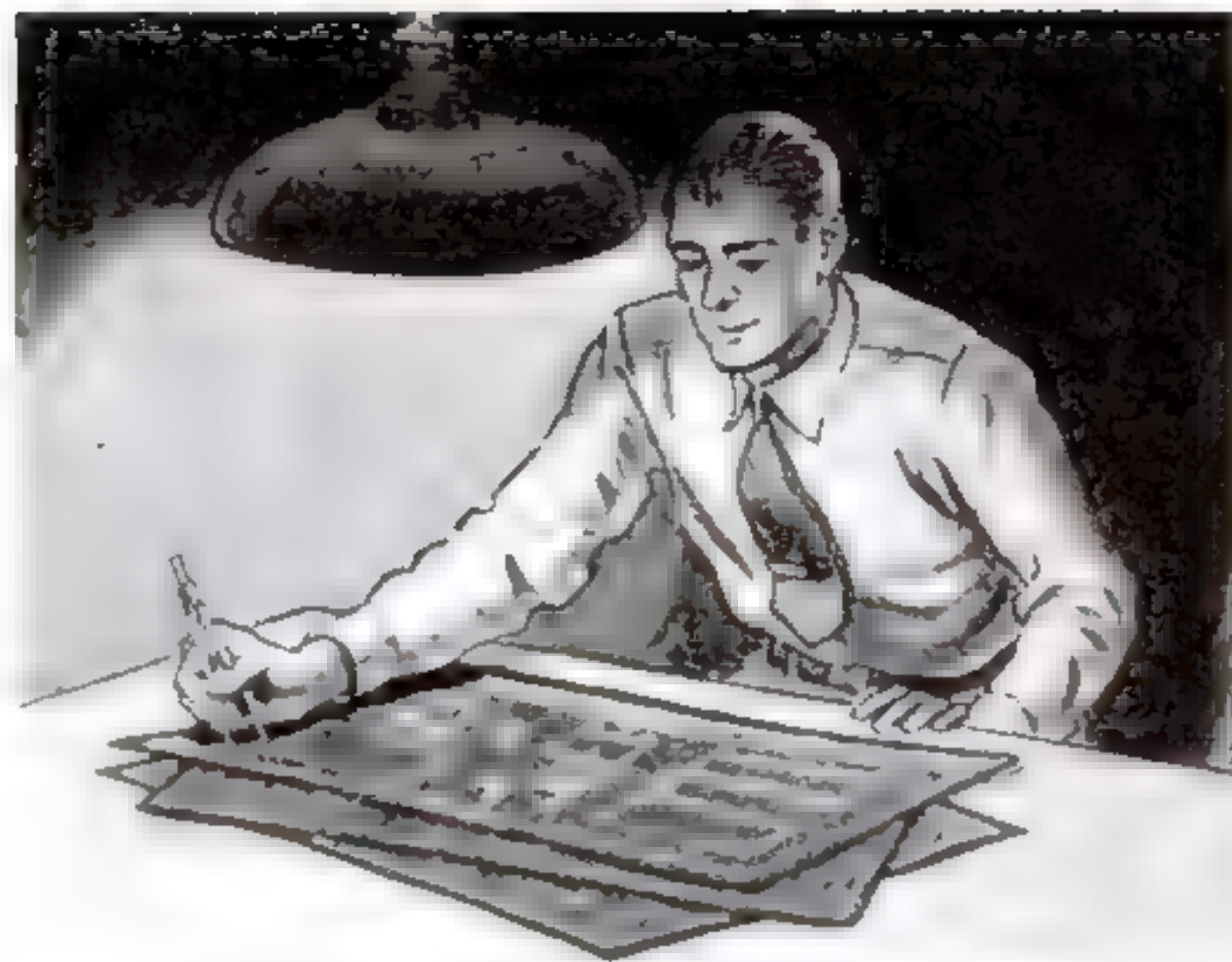
This new Driver Band Saw offers a wide usefulness. Its keen blade, traveling at 2535 feet per minute, zips through heavy oak or a scrolled panel with equal ease. It rips, cross-cuts, makes curved, angle and mitre cuts accurately. The carefully-balanced wheels, running on large, dust-sealed ball bearings—the heavy one-piece cast iron frame—the big 16" x 16" tilting table—all are quality features that will amaze you at the low price.



The craftsman who works in metal will find this new 14" metal-cutting saw lightens his labor and extends the scope of his work. It cuts sheets, rods, tubes and blocks with amazing speed and accuracy. Wide range of speeds permits cutting molded plastics or hard die steel. Speed range with recommended motor, 175 to 4630 feet per minute; eight speeds, provided by positive geared unit.

When you see these new saws and get the low prices, you'll appreciate the value built into them. New 1939 catalog on request. Walker-Turner Co., Inc., 219 South Ave., Plainfield, N. J.

**DRIVER** *Engineered* **POWER TOOLS**



## GOOD BLUEPRINTS

### Simplify Your Workshop Problems

**B**EFORE starting the next project in your home workshop, be sure to obtain accurate plans that have been designed and tested by experts. Our blueprints are the result of a pioneer effort begun in 1922 to provide readers with authoritative drawings at a nominal price. Now this service has grown to be the greatest of its kind. Some of our blueprints are listed below; a complete list will be sent upon receipt of a stamped, self-addressed envelope.



#### MODELS

|   |        |
|---|--------|
| Brig MALEK ADHEL, 20" hull, frame-and-plank or solid-hull construction, 304-305-306-R ..... | \$1.25 |
| Clipper Ship in a Bottle, 121-122.....  | .50    |
| Clipper Ship SOVEREIGN OF THE SEAS, 20½" hull, 51-52-53-R.....                              | 1.00   |
| Cody Coach, 13" long, 144-145-146-R.....  | 1.00   |
| CONSTITUTION ("Old Ironsides"), 21" hull, 57-58-59-R .....                                  | 1.00   |
| Cruiser U.S.S. INDIANAPOLIS, 12" long, 216.....   | .25    |
| Farragut's Flagship HARTFORD, 33½" hull, 221-222-R .....                                    | 1.50   |
| MAYFLOWER, 24" long, 83-84-85-R .....   | 1.00   |
| New Bedford Whaleboat, with complete equipment, 14" long, 326-R.....                        | .50    |
| Old Naval Gun, a six-pounder in battery; gun is 7½" long; 9" by 11½" overall, 352.....      | .25    |
| Privateer SWALLOW, a Baltimore Clipper, 13" hull, 228-229-230-R.....                        | 1.00   |
| Racing Yacht, 20" Marconi-rigged sailing model, 48-R .....                                  | .50    |
| Show Boat, Mississippi River type, 14" long, 263 ..   | .25    |
| Spanish Treasure Galleon, 24" long, 46-47.....  | .50    |
| Trading Schooner, 17½" hull, 252-253 .....  | .50    |
| U. S. Battleship TEXAS, 3' hull, 197-198-199-200....  | 1.00   |
| Viking Ship, 20½" long, 61-62-R.....  | .75    |

[Construction kits are available for some of these models. Turn to page 224.]



#### BOATS

|  |      |
|--|------|
| Combination Boat, 15' long, for sail, outboard motor, or oars, 131-132-133-R ..... | 1.00 |
| Folding Duck Boat, 13' long, 170-R.....  | .50  |
| High-Speed Boat for Small Outboard Motors, 7'11" long, 257-R.....                  | .50  |

(Continued on page 222)



*for better smoking*  
... here's tobacco men like  
in the big tin they prefer.

*and for Christmas*  
... send Dad or brother,  
husband or friend a pound  
of Velvet ...

*you  
couldn't  
please 'em  
better*



*Better  
smoking  
tobacco*

Copyright 1938, LIGGETT & MYERS TOBACCO CO.





**CUTTING TAPERS**  
A hinged jig, with means for securely holding one end of work away from fence, makes cutting of tapers easy.

## Amazing money's worth KEYSTONE made by DISSTON CIRCULAR SAWS

Very little money buys a dependable blade ... a KEYSTONE Circular Saw — made by DISSTON! Expert sawmakers designed these saws specially for fine craftsmanship, at low cost, in your home workshop.

Keystone Saws are amazing values. They fit your machine and suit your work. Run true, stay sharp. Ask dealer for KEYSTONE Home Workshop Circular Saws — made by DISSTON.

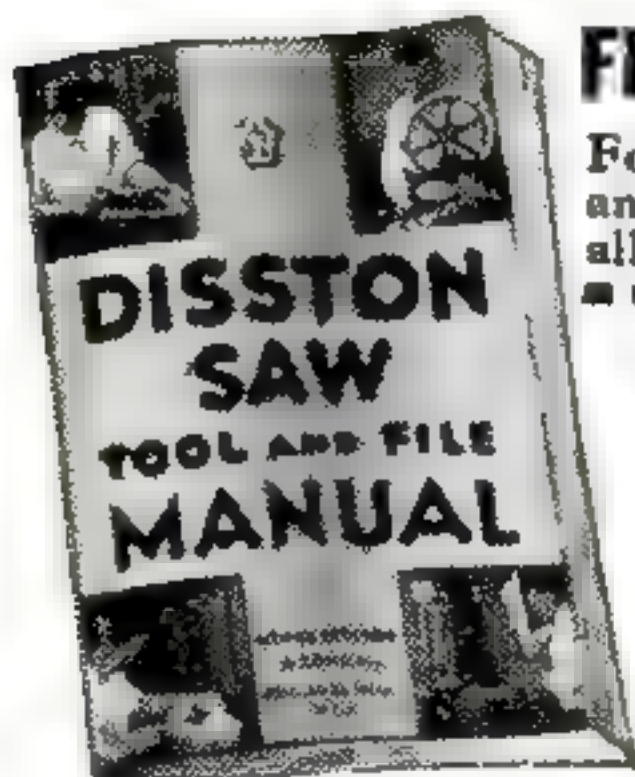
*Cross-Cut; Rip; Combination*

6" (1/2" hole) \$1.70      8" (1/2", 5/8", 3/4" hole) \$2.00  
7" (1/2" hole) \$1.80      10" (5/8", 3/4" hole) . . \$2.40

Rip Saws slightly less  
Hollow Ground, \$3.00 to \$5.00



Also KEYSTONE made by DISSTON Hand Saws. Skew-back and straight, cross-cut and rip. Prices, \$1.00 and up. K-3" Pacemaker, "skew-back, 26" blade, \$1.50  
Prices slightly higher in Canada



### FREE BOOK SEND COUPON

For free copy of "Disston Saw, Tool and File Manual" — tells how to sharpen all kinds of saws, send this coupon to:

HENRY DISSTON & SONS, INC.  
110 Tacony, Philadelphia, U. S. A.

Name .....

Address .....

## Blueprints for Home Shops

(Continued from page 220)

|  |     |
|--|-----|
| Midget Boat or Pram, 9' long, for oars, sail, or outboard motor, 339-R.....                                  | .50 |
| Motorboat-Rowboat, 16' long, with decked hull, for use with outboard or inboard drives and oars, 149-R ..... | .50 |
| Sectional Rowboat, 9' 8" long; can be used with small outboard, 340-341-R.....                               | .75 |
| Utility Rowboat, 13' long; can also be sailed or driven by outboard motor, 224-R.....                        | .50 |



### FURNITURE

|  |     |
|--|-----|
| Colonial Writing Desk, Governor Winthrop style, 3'6" high and 3'8" long, 21      | .25 |
| Combination Bench and Tilt-Top Table, (no turning), 11.....                      | .25 |
| End Table, American Empire, 241A.....  | .25 |
| Flower Stand (38 1/2" high) and Novel Modern Lamp, 317A.....                     | .25 |
| Gate-Leg Table, 3'6" diameter, circular top with leaves up (no turning), 24..... | .25 |
| Kitchen Table Cabinet, 27" by 48" top, has folding seat (no turning), 27.....    | .25 |
| Magazine Rack and Wooden Wastebasket to Match, 296A.....                         | .25 |
| Modernistic Stand (24 3/8" high) and Bookcase (70 1/2" high), 88.....            | .25 |
| Sewing Cabinet of 1812, 178A.....  | .50 |
| Small Early Colonial Pine Chest, 32" long, 21" deep, 24" high, 308A.....         | .25 |
| Tavern Table and Scroll Mirror, 105.....   | .25 |
| Telephone Table and Stool, 18.....   | .25 |
| Tilt-Top Table, 20" by 24" top, 249A.....  | .25 |
| Upholstered Stool, 240A.....   | .25 |



### MISCELLANEOUS

|  |     |
|--|-----|
| Automatic Lighthouse Night Lamp and Pelican Design Sewing Kit, 255A.....                       | .25 |
| Bird and Animal Patterns, 56 .....   | .25 |
| Electric Train, Horse, and Doll House, 14 .....  | .25 |
| Electric Scoreboard for Basketball and Special Bookcase for Popular Science Monthly, 353A..... | .25 |
| Four-Treadle Hand Loom, 268A-269A.....   | .75 |
| Nautical Porch Lamp and Hanging Wall Cabinet, 280A .....                                       | .25 |
| Paddle-Wheel Magazine Rack, Ski Repairs, and Rack for Table-Tennis Paddles and Balls, 343A.... | .25 |
| Perpetual Star Chart, 214.....   | .25 |
| Six Simple Block Puzzles, 65.....  | .25 |
| Toy Lathe, Drill Press, Saw, and Jointer, 113.....   | .25 |
| Turned and Inlaid Buffet Set (bowl and pair of candlesticks), 307A.....                        | .25 |
| Wood Mosaic Serving Tray and Novelty Wooden Book Ends, 297A.....                               | .25 |



### RADIO

|  |     |
|--|-----|
| Amateur Continuous Wave Transmitter, two tubes, either 171A, 245, or 210. Blueprints Nos. 183-184..... | .50 |
| Amplifier, Three Stage, 42.....  | .25 |
| Five Tube Short-Wave Set, midget receiver with loudspeaker, A.C. or D.C., 223.....                     | .25 |
| One-Tube Receiver, battery operated, 103.....  | .25 |
| Screen Grid Receiver, 109.....   | .25 |
| Short Wave Converter, 137.....   | .25 |

### POPULAR SCIENCE MONTHLY 353 FOURTH AVENUE, NEW YORK

Send me the blueprint, or blueprints, numbered as follows:

I am inclosing.....dollars.....cents

Name .....

Street .....

City and State.....

(Please print your name and address very clearly)



## SpeedWay

### Real Quality Tools

Designed, manufactured and guaranteed by SpeedWay, for 3 years leading manufacturers of industrial drills, these are really fine tools, correctly designed, correct speeds, genuine high torque drive motors. Small, handy, powerful; 1000 RPM—drill handles to 1 1/4" in steel. The cast handle and gear housing, \$7.95. 20,000 RPM Grinder with collets for 1/8" and 3/32" arbors, equal in every way to grinders costing several times \$5.95. No. 250 AIT, both drill and grinder with 5 accessories in steel carrying case \$14.95. Complete line of accessories and drill press stand. Write for Circular. Dealers Wanted.

**SPEEDWAY MFG. CO.**  
1842 S. 52nd Ave., Cicero, Illinois

**DRILL \$7.95**  
**GRINDER \$5.95**  
**SET \$14.95**

## FREE

### Craftsmanual

Send 25c (stamps or coin) for big jumbo size package of Monite Aircraft glue, and copy of 16-page Craftsmanual complete with working plans, both postpaid.

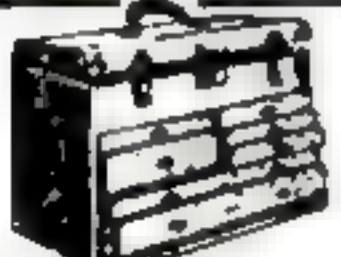
**Monite Waterproof Glue Co.**  
13 Monite Building  
Minneapolis, Minnesota



### GERSTNER Tool Chests

Always please particular men. Free Catalog for Machinists, Tool, Die and Pattern Makers.

**GERSTNER TOOL CHESTS**  
539 Columbia St. Dayton, Ohio



## THIS IS THE Life

Don't merely WISH for fun. HAVE GOOD TIMES! Join a motorcyclers' club—make new friends—go places and do things! See the Harley-Davidson dealer and his 1939 models. Write for literature and FREE copy of motor cycling magazine, "The ENTHUSIAST." Harley-Davidson Motor Co., Dept. PS-139, Milwaukee, Wis.

### HARLEY-DAVIDSON Motorcycles



## BIG NEW STREAMLINED LATHE

Swings 10" dia. At Sensational Bargain Price

Imagine! This extra heavy wood lathe, steel bed 48" long, at low prices. Heavy duty head stock, 4-step cone pulley for V-belt. No. 2 Morse Taper Centers. Sealed ball bearings. 6" face plate screws on to spindle. Tool rest 10" long. Complete line of accessories at amazing low prices. Write today for free catalog describing Blue Star full line precision woodworking machinery. Factory-to-you prices. Not sold through agents.

**BLUE STAR PRODUCTS**  
501 Wood Ave. Fairfield, Iowa



## BUILD THE CUTTY SARK

2 ft. model of the famous clipper ship

Everything...including CARVED WOOD HULLS, Painted-Balsa Decks, Cast-Metal Life-boats, Anchors, Bitts, Sheaving Wheel, Chains, Mast, Spars, Rigging, Cement, Colored Lacquer—Full-Size Plans and Instructions.

Send for Catalog all Ideal's new Models 10¢

**IDEAL AIRPLANE & SUPPLY COMPANY, INC.**  
26 West 19th Street, New York

Complete kit makes perfect building easy. **2.50** plus 15¢ postage



### BABY CALCULATOR CHICAGO USA PATENT APPLIED FOR

## Vest Pocket ADDING MACHINE

IDEAL XMAS GIFT Does work of more costly machine. Counts up to million, made of steel!—weighs 8 ozs. Simple, accurate

**FREE TRIAL!** Not a toy. Guaranteed 5 years. **SEND NO MONEY!** Order from ad—not sold in stores. Just send name and address. On delivery, pay postman \$2.50 (plus postage). If not satisfied after 10 DAYS' Trial you get your money back. Thousands of Satisfied Users. Write for Agents' Proposition. Calculator Machine Co., Mfrs., P. O. Box 1118, Dept. 401, Chicago, Ill.

**\$2.50** Total Cost



## THE NATION'S NEWEST MUSICAL SENSATION!

### PLAY IT LIKE AN EXPERT... WITHOUT A LESSON

Imagine! A real musical instrument swing bands use—that costs so little everybody can have one. Even if you can't read a note you should be playing the latest hits in a short time. Featured at dealers everywhere—or order direct. We'll mail a Tonette complete with easy instruction melody chart anywhere in the United States in time for Christmas upon receipt of \$1.

**TONETTE COMPANY** Dept. PS-1  
30 East Adams Street, Chicago

## TONETTE

ANYONE CAN PLAY IT!

**\$1.00 POST PAID**



## CLAMPS

Use more clamps as "helps" for firmer joints, for setting-up, for accurate drilling, sawing and joining, for holding, drawing-in and lifting—you can't have too many good clamps, and "Jorgensen" and "Pony" Clamps are the very best. Those illustrated have been selected for the home work shops.

**ADJUSTABLE CLAMP CO.**  
"The Clamp Folks"

408 N. Ashland Ave. Chicago, U. S. A.

Pony Minia-tures 9 types —1" to 2 1/2" cap. Not toys but fine tools with 100 uses.

Pony "50" Fittings go on ordinary 1/2" pipe. Any length. Send \$3.00 plus postage (16 lbs.) for fittings for two "50" Clamps. Also "Pony" No. 62 Fittings for 1/2" pipe—2 sets for \$1.50 plus postage.

**Catalog FREE**

**Jorgensen Handcraws**  
Genuine "Jorgensen" Handcraws grip at all angles, never slip, split or loosen. All sizes. Send \$3.20 plus postage (7 lbs.) for 2 No. 1 Handcraws—open 6".





When Writing Advertisers  
Please Mention POPULAR SCIENCE

## MEGOW'S GAS-POWERED MODEL AIRPLANE

### The Cardinal

World's champion Bassett's new 48" gas-powered crackup-proof sensation! Finished prop., many ready-made parts, rubber wheels. Also the famous QUAKER FLASH, FLYING QUAKER and others. Also rubber-powered Giant Fliers with motor-hum device \$1.00 up.

**\$3.95** plus 20c post.

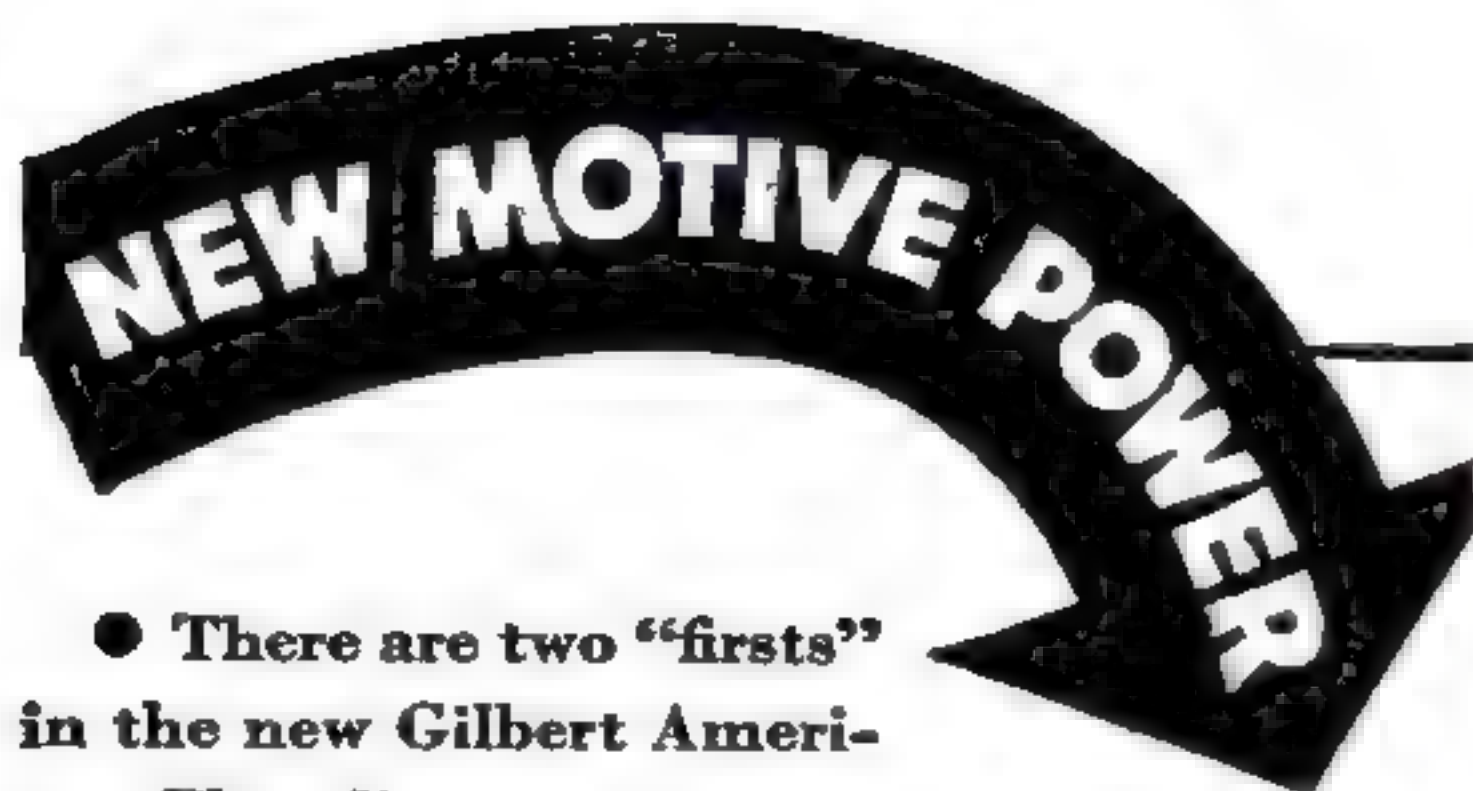
SHIPS WITH READY-CARVED HULLS... many ready-made parts, complete plans and materials. XEBEC (Rob. Crusoe); HISPANIOLA (Treasure Island) ARABELLA (Capt. Blood) and others, \$2.00 (15c postage).

HO-GAUGE MODEL RAILROADS. Most realistic freight cars. 50c. Send 5c postage for 100-page illustrated catalog Model Kits, ready-made parts and supplies.

**MEGOW'S** Dept. PS—Howard & Oxl. Sts. Philadelphia, Pa. or 217 N. Desplains St., Chicago, Ill.

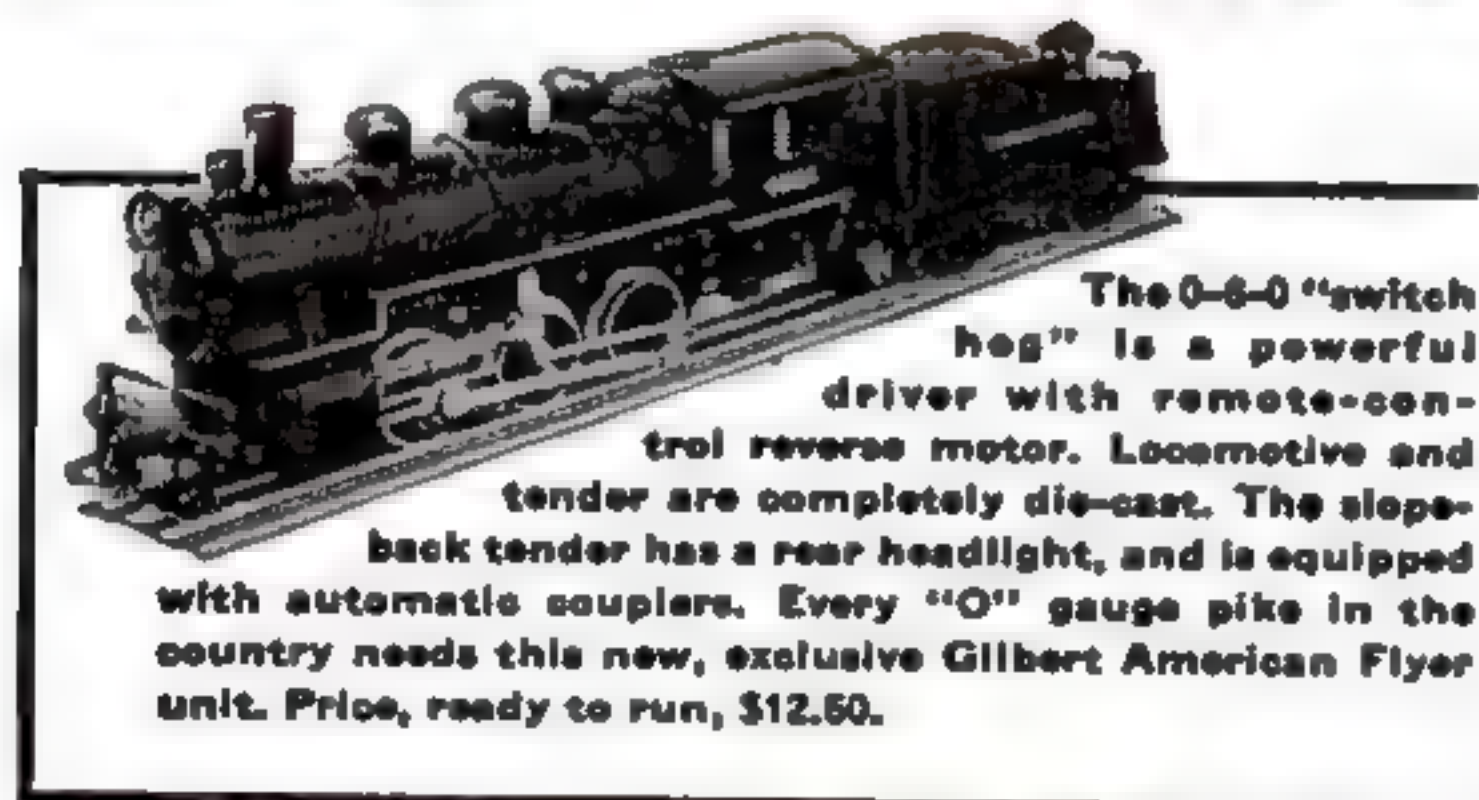




● There are two "firsts" in the new Gilbert American Flyer line . . . the new switching locomotive and the new B. & O. "President Washington." "O" gauge men wanted them! A. C. Gilbert has built them, just as they should be built. Top quality in design, proportion and detail. Top quality in construction and workmanship.

## FOR "O" GAUGE PIKES



The 0-6-0 "switch hog" is a powerful driver with remote-control reverse motor. Locomotive and tender are completely die-cast. The slope-back tender has a rear headlight, and is equipped with automatic couplers. Every "O" gauge pike in the country needs this new, exclusive Gilbert American Flyer unit. Price, ready to run, \$12.50.

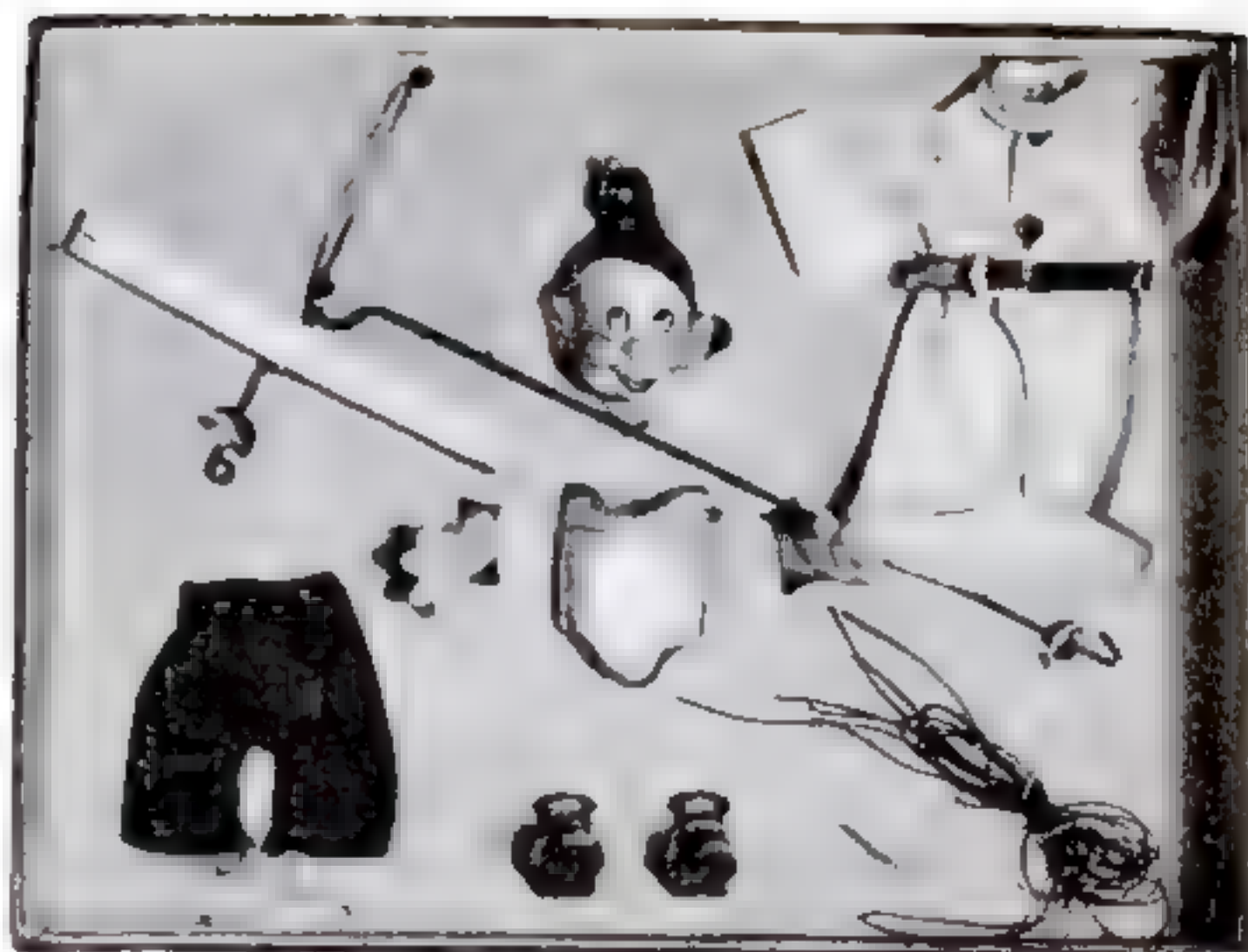


Few "O" gauge locomotives offer the true-to-life lines and proportions of the new B. & O. "President Washington." It's the 4-6-2 Pacific type, with remote control and six-wheel drive. Locomotive and tender completely die-cast. A "natural" for fast passenger and freight service. Price, ready to run, \$15.

● Send for your FREE copy of the new Gilbert American Flyer Catalog. Get the latest train news right off the press.

# GILBERT AMERICAN FLYER TRAINS

MADE BY THE A. C. GILBERT COMPANY  
518 Erector Square New Haven, Connecticut



## Our Marionette Kit of DOPEY Makes a Unique Gift

NEED a last-minute Christmas gift? Our marionette kit is just the thing for both children and adults. They will get a lot of fun out of assembling and manipulating a marionette of Dopey, that comical little fellow in Walt Disney's animated fairy tale, "Snow White and the Seven Dwarfs." All the parts are completely finished and can be put together in half an hour or less. The price is only \$2.25, but if you live west of the Mississippi River or in Canada, add 25 cents.

We also have a wide variety of construction kits containing all the necessary raw materials for making ship models and model railroad equipment. The complete list follows:

### SIMPLIFIED SHIP MODEL KITS

- |  |      |
|--|------|
| F. Liner S.S. MANHATTAN, 12" long.....           | 1.00 |
| H. Cruiser U.S.S. INDIANAPOLIS, 12" long.....    | 1.50 |
| J. Clipper SEA WITCH, 9½" hull, 13" over all.... | 1.50 |

### MODEL-OF-THE-MONTH KITS

- |   |        |
|---|--------|
| M. Aircraft carrier SARATOGA, 18" long.....                                 | \$1.00 |
| N. Convoy of four U.S. destroyers, each 8¼" long                            | .75    |
| R. U.S. cruiser TUSCALOOSA, 11¾" long.....                                  | 1.00   |
| U. HISPANIOLA of the book and movie "Treasure Island," 7" long.....         | .50    |
| Z. H.M.S. BOUNTY, 8½" hull, 11½" overall.....                               | 1.50   |
| 2M. Ocean freighter, 14" long.....  | 1.50   |
| 3M. Yacht NOURMAHAL, 8½" long.....  | 1.00   |
| 4M. Oil tanker, 14" long.....   | 1.50   |
| 5M. Liner PRESIDENT LINCOLN, 14¾" long....                                  | 1.50   |
| 6M. Fishing Schooner WE'RE HERE of "Captains Courageous," 9½" over all..... | .75    |

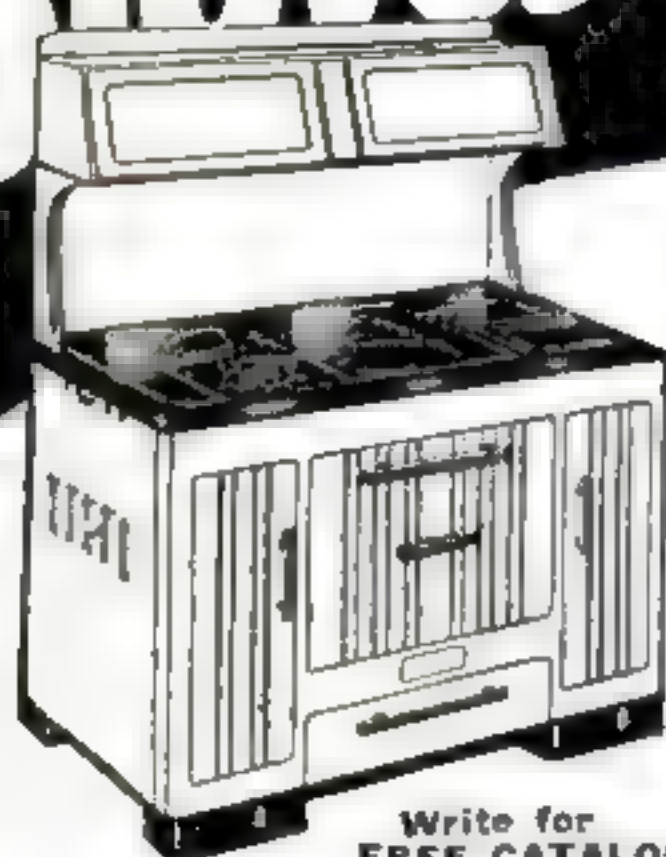
### STANDARD SHIP MODEL KITS

- |  |       |
|--|-------|
| A. Whaling ship WANDERER, 20½" hull, 27" over all .....                                    | 7.40* |
| D. Spanish galleon, 24" hull, 30" over all.....  | 6.95* |
| E. Battleship U.S.S. TEXAS, 3' long.....   | 7.45* |
| G. Elizabethan galleon REVENGE, 25" hull, 28" over all .....                               | 7.25* |
| L. Farragut's flagship HARTFORD, steam-and-sail sloop-of-war, 33½" hull, 41" over all..... | 8.45* |
| Q. Privateer SWALLOW, a Baltimore clipper, 12½" hull, 20" over all.....                    | 4.95† |
| V. Clipper SOVEREIGN OF THE SEAS, 20½" hull, 26" over all.....                             | 4.95† |

(Continued on page 226)



# Stoves AT FACTORY PRICES!



## SALE CATALOG—FREE

Nearly 200 Styles and Sizes of Heaters, Ranges, Furnaces at FACTORY PRICES. Easy Terms. Write today for FREE CATALOG. New styles, new features—24-hour shipments.

Kalamazoo Stove & Furnace Co.,  
721 Rochester Avenue  
Kalamazoo Michigan  
Over 1,300,000 Satisfied Users  
39 Years in Business

**"A Kalamazoo Direct to You"**  
Trade Mark Registered

Write for  
FREE CATALOG



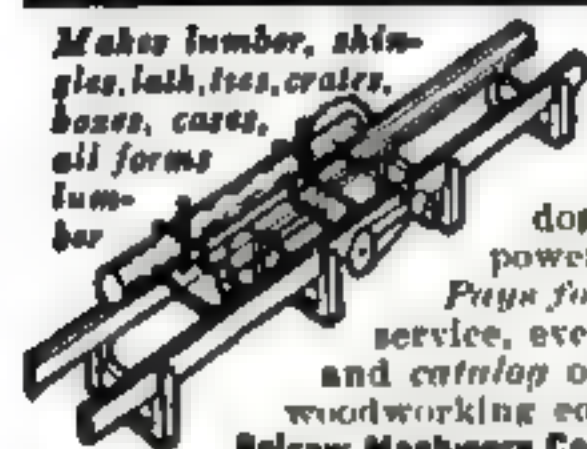
NOW ONLY  
**\$5.00**

## REAL ENGINE VALUE

Over 7,000 GHQ Gas Engine Kits have been sold at \$8.50. Now is your chance to buy the New Improved kit for \$5.00. Absolutely complete with coil, plug, etc. 1/5 H.P. All parts guaranteed. For boats and planes. Send only \$1. Shipped Exp. Coll. for balance same day. Catalog 3c. **DEALERS WRITE.** A screwdriver is the only tool needed. Average assembly time 30 minutes.

**GHQ MOTORS, 854S East 149 St., New York, N.Y.**

## ONE-MAN SAWMILL



Makes lumber, shingles, lath, ties, crates, boxes, cases, all forms lumber

## TURN TREES INTO MONEY WITH A BELSAW

Three capacities: 10, 14 and 20 ft. Accurate set works positive dogs. Hand or power feed. Runs on low power—many owners use old auto engine. Pays for itself quickly—thousands in commercial service, everywhere. Write for free lumber handbook and catalog of mills, supplies, tools, saw tables, and woodworking equipment

Belsaw Machinery Co. 848-M Davidson Bldg. Kansas City, Mo.

FARM MODEL  
**\$49.00**



## GET YOUR TRACTOR AT FACTORY PRICE

3 Speeds  
Fwd. and Reverse.  
Runs 4 to 8 hrs. per gallon

Amazing money maker for farms, truck gardens, orchards, nurseries, poultry ranches, country homes, etc. Plows, discs, harrows, cultivates, mows lawns, cuts weeds. Runs belt machinery. 2 to 6 H. P. riding or walking types. Write for FREE CATALOG. Low Factory Prices and 10 day Trial Plan. Address Nearest Office.

SHAW MFG. CO., 5701 Front St., Galesburg, Kans.  
138 PS West 42nd St., New York, N.Y. 5812 PS Magnolia Ave., Chicago, Ill., 888 PS North 4th St., Columbus, O.

**SHAW BU-ALL TRACTOR**

## WOOD CARVING and WHITTling AN ARTISTIC HOBBY FOR ALL

This brand new manual shows you how to do every kind of wood carving. How to carve jewel boxes, picture frames, trays, chests, furniture, etc. How to do chip carving, level surface carving, incising, carving in relief. Carving human and animal figures in the round completely explained and simplified. 256 Pages. Fully illustrated,—full cloth bound. Send only \$2.00 and your copy will be sent postpaid, or order COD plus postage if you wish. *Money back if not satisfied.*

**Popular Science Monthly—Dept. 19**

**353-4th Ave.**

**New York, N. Y.**

# Treet Topics

YOU'LL NEVER  
MISS THE  
DIME ~



SO WHY  
MISS  
THE  
COMFORT



UMMM--  
NOT A  
SCRAPE

AND WHY MISS THE MISSES...



WHEN YOU  
CAN DO  
THIS:-

TREET  
BLADES!

YESSIR  
4 FOR 10¢



-AND TREET YOURSELF  
TO A PACK OF  
PERFECT SHAVES!



**4 FOR 10¢**

**Treet SINGLE  
EDGE  
BLADES**

**FOR GEM AND EVER-READY RAZORS**

Treet Safety Razor Corporation, Newark, New Jersey



# BIG MONEY!

ASSEMBLING MEAD'S

## New PORTABLE KI-YAK

IN A FEW DAYS AT HOME!



**—from Complete Cut-To-Fit Construction Kit!**

**Weight as little as 20 LBS.**

**Use with PADDLE! OARS! SAIL! MOTOR!**

**Assemble for PROFIT or Personal FUN! NO Experience Needed!**

MEAD'S perfected, patented, aluminum-clad Cut-To-Fit Construction Kit GUARANTEES successful assembly easily quickly **IN A FEW DAYS** in a few days at home with simple hand tools without previous experience. Build yours for personal sport use, or sell at unparallel profit! Mead's quality KI-YAKS (available in 5 models, kits or factory assembled) are beautiful and PORTABLE. Take yours anywhere by hand or car for paddling, sailing, rowing, outboarding, touring, fishing, camping, hunting. Leak proof. Sea worthy. Durable. **THOUSANDS** in use. Strong as a giant, light as a feather! More fun at less cost! \$4.00 Double Blade Paddle GIVE Y with your CK Ki-Yak if you hurry. Mail 10c and coupon below for Giant Colored Circular, special paddle offer. Low Introductory Prices!



**OK-2**

Weights only 50 lbs. Takes ANY Outboard 4 1/2 H. P. or less!

Carry motor in one hand—OK-2 in other!

**AMAZING LOW COST!**

Don't buy any boat until you see the amazing Low Introductory Prices on MEAD KI-YAK Construction Kits and Factory-Built jobs. (You can even Pay As You Build, on our special Progressive Group plan!) **EARN** money assembling, selling! Remember, Mead KI-YAKS are unsurpassed... the lightest, strongest, most portable boats of their kind! Join in the **FUN**—and **PROFITS** being made. Rush Coupon and name **NOW** for Free details **BEFORE** prices go up!

**Mail Coupon NOW!**

OK-2 as rowboat.

OK-2 as motor boat. Convertible in 10 minutes into fast sailboat.

**\$6 PADDLE GIVEN**

with your CK-KI-YAK—if you hurry!

**MEAD GLIDERS**

15 S. MARKET ST. Dept. D-19 CHICAGO, U.S.A.

"CK" Paddle and sail

Gentlemen: I enclose 10c as handling, postage charge. Please rush your New Colored KI-YAK Circular, Low Introductory Prices, and \$6 Gift Paddle Offer. (Please Print Plainly)

NAME.....

STREET & NO.....

CITY..... STATE.....

**RUSH ME WITH 10c TO—**

## Our Kits Make Fine Gifts

(Continued from page 224)

- Y. Trading schooner, Maine type; 17 1/2" hull, 22 1/2" over all..... 4.90†
- 2S. U.S. Navy destroyer PRESTON, 31 1/2" long 5.95\*
- 3S. CONSTITUTION ("Old Ironsides") 21" hull, 31" over all..... 6.50\*
- 4S. Clipper ship GREAT REPUBLIC, 31 1/2" hull, 42" over all..... 8.40\*
- 5S. Coast Guard Patrol of 165-ft. type, 20 5/8" long (same as President's yacht POTOMAC)..... 4.95\*
- 6S. Brig MALEK ADHEL, 20" hull, 33" over all; frame-and-plank construction... 9.75†
- 8S. Fishing schooner BLUENOSE, 17 1/2" hull, 22" over all..... 4.95†
- 9S. New Bedford whaleboat, with complete equipment, 14" long..... 2.75†
- 10S. Confederate raider ALABAMA; steam sloop, bark rigged; 21 1/2" hull, 28" over all..... 8.20\*

### MODEL RAILWAY KITS

- 1L. HO-gauge, Hudson-type model locomotive and tender, 14" long..... 9.95\*
- 2L. Supplementary power unit for locomotive 1L; consists of 6-volt motor and worm and gear 4.50
- 3L. HO-gauge track kit. Contains raw materials for making 25 ft. of track..... 4.00\*
- 4L. Deluxe track kit. Same as 3L except that kit contains third-rail chairs..... 6.95\*

### MISCELLANEOUS

- 4. Solid mahogany book trough, 22 1/2" long, 9 1/2" wide, and 24 3/4" high. Ready to assemble 5.30\*
- 5. Solid rock maple hanging wall rack, 19 1/2" wide, 33 1/4" high. Ready to assemble..... 5.75\*



This ocean freighter is built with Kit 2M

- 7. Whittling kit with two shaped blocks for making sea captain 5 1/2" high..... 1.50
- 8. Whittling kit for six different Scotties; each is 2" by 2 1/4", sawed to shape..... 1.00
- 10. Copycraft whittling kit for making one of several Hobo Hank novelties. Includes master model 5 1/2" high..... 1.50
- 12. Marionette kit for making a model of Dopey the Dwarf, 9" high. Hand-painted head and complete parts, ready to assemble..... 2.25†

Note: If you live west of the Mississippi River or in Canada, add 50 cents to prices marked with an asterisk (\*) and 25 cents to prices marked with a dagger (†).

**Popular Science Monthly, Dept. 19A**  
353 Fourth Avenue, New York, N. Y.

Please send me C. O. D. Kit.....

I will pay the postman the price shown above plus a few cents postage in full payment. (Canadian orders cannot be sent C. O. D.).

Name.....

Address.....

City..... State.....

(Please print your name and address very clearly)

If you prefer to send your remittance with this order, you save the C.O.D. charge. Remit by money order, check, or registered mail. This offer is made only in the United States and Canada. Also see note above.



## \$1.50 **TEST-O-LITE**

At  
Elec-  
trical  
Stores  
or  
Post-  
paid



### Tests Everything Electrical

The Neon Light tells instantly where trouble lies in electric circuits, fuses, cut-outs, motors, radios, etc. Has 1,001 uses for electricians or home. Tests any voltage 110 to 550; tells A.C. from D.C. Excels ordinary clumsy test bulb. Fountain-pen size with pocket clip. Lifetime guarantee.

L. S. BRACH MFG. CORP.  
55 Dickerson St. Newark, N. J.

## \$2.50 LEJAY ARC WELDER NOW ONLY \$1.50



Complete kit of parts for making our genuine LeJay welder which has proved such a sensation. Thousands sold to satisfied customers at \$2.50 each. LeJay now offers its customers this famous tool in kit form at a saving

of \$1.00. Complete with carbon tip, solder, welding and brazing rods. Easy to assemble—no other parts needed. Operates from car battery. Welds most metals. Your first repair job will almost pay for the small amount you spend for this amazing tool! 10 day money back guarantee. Send \$1.50 for your welder to LeJAY MFG. CO., 1323 LeJay Bldg., Minneapolis, Minnesota



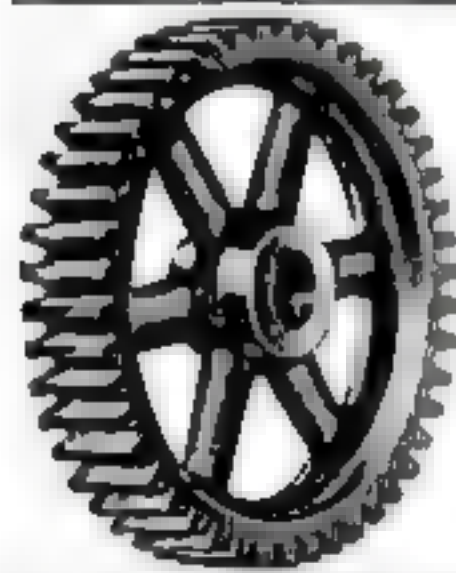
## A Gift in the Right Direction

Everyone on your gift list will receive lasting enjoyment and practical use from a Hull Streamline Auto Compass—directions of travel are never a problem. Streamlined Bakelite case, built-in compensator, genuine sapphire bearing. Follow this excellent gift suggestion—only \$2.95 at your dealer. Attractive holiday package. Write for circular.

Hull Mfg. Co., P.O. Box 246-E9, Warren, Ohio



**ELECTRIC FUN!** 200 stunts with 110 volts. Book tells how to make arcs, motors, buzzers, floating rings, window displays, electric magic etc. **\$1.00**  
**HIGH VOLTAGE FUN!** Companion book of 200 advanced experiments. **\$1.00**  
**SPECTROSCOPE** quickest, surest way to analyze chemicals or ores with chart to identify elements and book of 100 experiments. **\$2.50**  
**STROBOSCOPE** with 110 volt motor, neon lamp and book of 100 experiments. **\$1.00**  
**MAGIC** Phosphorescent Rod glows in the dark in 8 colors. **\$1.00**  
**CUTTING & SONS** 19 S Street Campbell, Calif.



## GEARS

In Stock—Immediate Delivery

Gears, speed reducers, sprockets, thrust bearings, flexible couplings, pulleys, etc. A complete line is carried in our Chicago stock. Can also quote on special gears of any kind. Send us your blueprints and inquiries.

Send 10c for Complete Catalog No. 214

**CHICAGO GEAR WORKS**  
769-773 W. Jackson Blvd. CHICAGO, ILL.

## DO YOU

WANT a new business profession of your own, with all the trade you can attend to? Then become a foot correctionist, and

in a few weeks earn big income in service fees.—not medical nor chiropody—easy terms for home training, no further capital needed, no goods to buy, no agency. Established 1894. Address Stephenson Laboratory, 62 Back Bay, Boston, Mass.

## MODEL SHIP & YACHT FITTINGS

Complete fittings and construction sets for all popular models. Sails, hulls and all fittings for model racing yachts. Send 20c (coin) for latest, illustrated catalog. Shows hundreds of items you need.

A. J. Fisher, 1002-2 Etowah Ave., Royal Oak, Mich.



## Woodworker's Turning and Joining MANUAL

The simplest, most practical ways to make end tables, chairs, benches, highboys, bookracks, cabinets, all kinds of furniture in your spare time. A revelation of simplicity and helpfulness. Many illustrations. Full cloth bound \$1.00.

**POPULAR SCIENCE MONTHLY**, Dept. 19  
353 Fourth Ave. New York, N. Y.

## for a Merry Christmas and a HOBBY NEW YEAR



**Modern Craftsman's Kit**  
Model 2...\$23.50  
Model 1...\$17.50



Price  
\$9.85 Post-  
paid

Model 1

## All-Purpose MOTO-TOOL

Moto-Tool makes an attractive, practical gift every craftsman will appreciate—for no other motor-in-hand tool in its class matches Moto-Tool in speed, power, ease of handling or in exclusive construction advantages that provide, long trouble-free service. Moto-Tool does in seconds jobs that require hours of hard hand work. Handles all accessories, works on all materials, runs on A. C. or D. C. Absolutely safe. Thousands in use. Model 1, 6 oz. 25,000 r. p. m., for light work. Model 2, more powerful, 13 oz. about 27,000 r. p. m. \$16.50 postpaid. At leading dealers—or order by mail on money-back trial. Write for free illustrated booklet.

Dremel Mfg. Co. 111 CT., Racine, Wis.

America's Exclusive Maker of Motor-in-Hand Tools



## WORLD'S SMALLEST POCKET

Tubeless  
Batteryless  
Wireless  
**RADIO**

BEAUTIFUL PLASTIC CABINETS

Midget radio fits your pocket or purse. Weighs only 4 ozs. Smaller than cigarette package! Receives stations with clear natural tone. NO CRYSTALS to adjust—NO UPKEEP—only one moving part. "Audiphone" gives superior performance. ENTIRELY NEW PATENTED DESIGN. Has 8-1 gear & enclosed luminous dial for perfect tuning. Many owners report amazing reception and distance. Sent complete with instructions for use in homes, offices, hotels, boats, in bed, etc. TAKES ONLY A SECOND TO CONNECT. Receives FREE operating power from radio stations.

## SEND NO MONEY!

Pay postman only \$2.99 plus postage on arrival or send \$2.99 (Check, M.O., Cash) and yours will be sent postpaid. GUARANTEED. A most unusual value. ORDER NOW!

TINYTONE RADIO CORP. DEPT. PS-1 KEARNEY, NEBR.

NEW  
1939  
MODEL

When Writing Advertisers  
Please Mention POPULAR SCIENCE



New 24"  
**LATHE**  
\$4.90  
POST-  
PAID

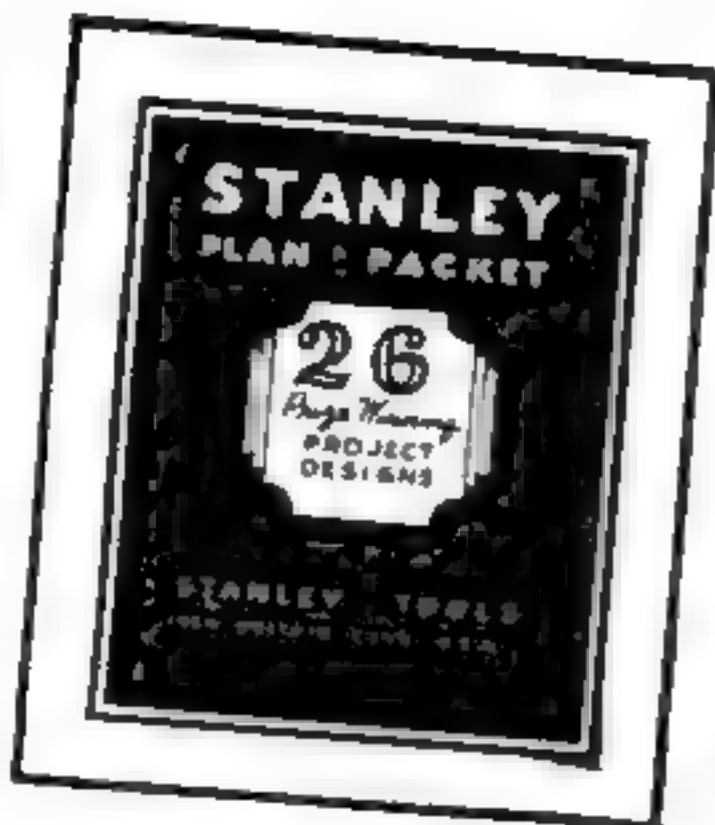
Free Catalog:

A heavy duty, smooth running wood lathe at a remarkable price. 32" long, 7" high. Turns pieces 4 1/2" in diameter by 24". Fully adjustable, 2-speed. Weighs 10 lbs. Long and short tool rests. OILLESS bushings. Satisfaction guaranteed or money back. Free Catalog describing \$150 prize contest (1st prize, \$25; 2nd, \$15; 3rd, \$10; 68 other cash and merchandise prizes). Cat. illustr. complete power tool line: Jig Saw, \$1.50; Shaper, Circular Saw with oilless bearings, \$3 each; Drill Press, \$2.50; 9 1/2" Lathe, \$2; Sander, \$1; etc. Order today or send card for Catalog.

J & N Metal Products Co. 3 Commercial St. Rochester, N. Y.



# NEW STANLEY PLAN PACKET



**ONLY 50¢**

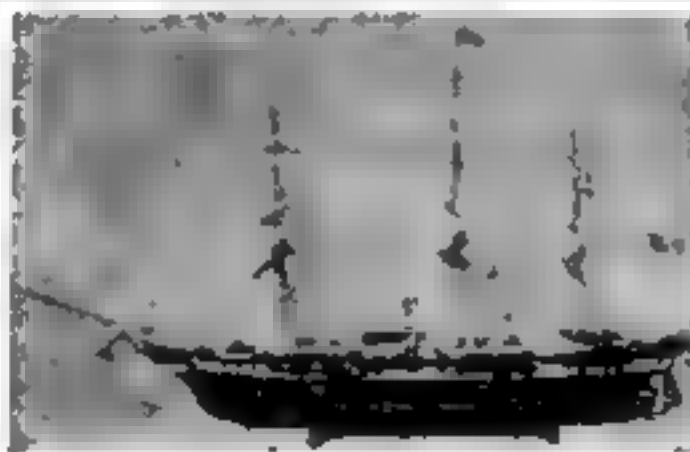
26 prize-winning plans for every man who enjoys working with tools and wood! You'll want to make every project, whether your shop is large or small. Important feature—each drawing is on a separate 8½ x 11" sheet of tough paper. Write today for the Stanley Plan Packet; only 50¢ postpaid anywhere in the U. S.

## STANLEY TOOLS

Division of The Stanley Works  
106 Elm Street, New Britain, Conn.

## SHIP MODELS

The quick and easy road to ship modeling is to get one of our accurate scale construction sets. With them you can concentrate on the interesting part of the model. Similar sets for models of Flying Cloud, Destroyer Preston, Constitution, U. S. S. Texas, Whaler Wanderer and many others. Also semi-finished hulls and all sorts of materials and fittings such as blocks, deadeyes, anchors, steering wheels, guns, lifeboats, etc. Large 64-page photographically illustrated booklet, describing the above sent postpaid upon receipt of 16¢ (coin). Many persons on receiving this booklet, have discovered how simple and enjoyable is ship model making. Be sure to get your booklet before starting your model.



Model Ship Supply Co. Dept. R Mineola, N. Y.

## NEW TYPE CHEAP OIL BURNER

*Sweeping the Country!!*

**COOK and HEAT Without Coal or Wood**

In Your Present Stove or Furnace—  
**HOTTER—No Drudgery,  
Dirt or Ashes—More Heat  
Quick at SMALL COST.**

**OVER 40,000 SOLD**

Beats any oil burner ever gotten out for low cost, perfect performance. Burns cheap oil a new way, without pre-generating or clogging up. Quick intense heat by Simple Turn of Valve.

**30 DAYS' TRIAL**

Prove its efficiency, convenience and economical operation.

Write Immediately for **FREE BURNER OFFER TO AGENTS**

**AGENTS  
Salesmen  
BIG MONEY**

F. Silversays: "I can dispose of 250 HEAT KINGS before this year ends." Sample Burner FREE to producers. Write us now for agents' offer.

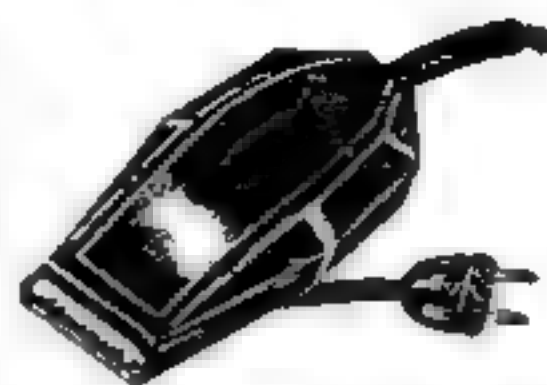


**Quick HEAT at  
Turn of Valve!**

who will demonstrate and take orders. Write quick, be first to learn how to make REAL MONEY right now, spare or full time—mail in postcard today.

UNITED FACTORIES, A-761, Factory Bldg., Kansas City, Mo.

# ELECTRIC SHAVER



At the Astonishingly  
Low Price  
of Only

**\$1.98**

Postpaid

Absolutely guaranteed, does work equal to much higher priced shavers. **DOUBLE EDGE SHAVING HEAD** for quicker, closer shaves. Fool-proof. Self-sharpening. Self-cleaning. Dependable, long-life motor for 110-volt AC current. Get this modern shaver now!

**H. A. HACKARD & SON**

3816 Belmont

Dept. P-1

Chicago, Ill.

**New  
Catalog**

—OF BARGAINS IN MILITARY,  
Outdoor and Sport Goods (Clothes, Shoes,  
Boots, Banquets, Tents, Firearms, Boy Scout  
Supplies, etc.) Send 10¢ for copy to be re-  
turned on first order.



**A AND N SUPPLY CO.**

Formerly Army & Navy Supply Co.  
4784 Lester St., Richmond, Va.



EST. 1868



## TRAILER PARTS

Latest type heating stoves, window assemblies,  
couplers. Everything for the trailer. 40 page  
illustrated catalog, 10¢.

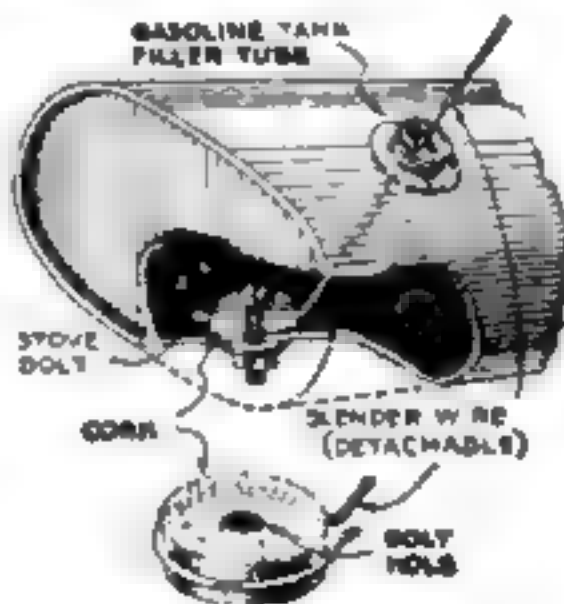
**MARVEL TRAILER PARTS CO.**  
19035 Celestine Ave., Detroit, Mich.

**ONLY  
3c  
DAILY**

TO GIVE YOU AND YOUR FAMILY HOSPITAL  
PROTECTION ANYWHERE IN THE UNITED  
STATES! Send penny post card at once for de-  
tails of this amazing nation-wide Health Insurance  
Plan. Write to North American Mutual Life Corp.,  
Dept. P. S., Wilmington, Del.

## Be Your Own Auto Trouble Shooter

**NEW SIMPLE HANDBOOK MAKES IT EASY**



A reduced drawing from  
AUTO KINKS showing  
how to repair hole in gaso-  
line tank without solder-  
ing. Complete explanation  
in book.

Now you can cut down monthly  
repair bills and keep your  
car in A-1 condition by doing  
yourself many easy tasks com-  
pletely explained in this brand  
new manual.

Anyone can follow the non-  
technical language in **AUTO  
KINKS** fully illustrated with  
drawings and simple diagrams,  
and find out just what to do no  
matter what goes wrong—how  
to make temporary or perma-  
nent repairs to the motor, car-  
buretor, fuel line, ignition,  
lights, starter, radiator, chas-  
sis, running gear, body, fen-  
der, top, and even the garage.

**AUTO KINKS** is a complete service manual which  
will save you many times its cost. Besides cutting  
your repair bills, you will get a lot of fun out of doing  
these simple jobs yourself. 192 pages, full strong cloth  
binding, pictures on every page, only \$1.00 C.O.D. plus  
a few cents postage.

**POPULAR SCIENCE MONTHLY—Dept. 19**  
353 Fourth Ave., New York, N. Y.

Send me **AUTO KINKS**. I agree to pay the postman  
\$1.00 plus a few cents postage when the book arrives.  
If I am not entirely satisfied with the book, I will return  
it to you within 5 days of receipt and you will refund  
my money in full.

Name.....

Address.....

City..... State.....





**S**QUARING operations of the semiprecision type are too often done in a surface grinder when a disk-grinding set-up would reduce the cost at least fifty percent.

When we are told that seamless steel tubing goes into the making of no less than thirty automobile parts, we know that many small machine shops are missing a bet by not using more of this labor-saving material.

Assorting scrap steel as you scrap it makes the only profitable scrap pile. There are too many scrap-pile fanatics who spend an hour or two digging out usable pieces and then brag that the material didn't cost a cent.

It takes but a few minutes to fit a brass tip to a lathe-dog screw. Results: better dogs and no dents.

A machinist friend said to me recently: "I ream considerably more and better holes with a single grind now that I keep a small oilstone in my apron pocket and touch up the chamfers occasionally."

Grind all taps to a 15-deg. three-thread chamfer if you are cutting through, but use a 33-deg. one-and-a-half-thread chamfer as much as you can for shoulder work.

A machine-shop slogan that has become popular is, "fewer tools but better ones." This means extra attention in handling, using, and servicing.

## Live Electric Wire Soldered Without Danger of Shock

ALTHOUGH amateurs should never attempt it, professional electricians sometimes find it necessary to solder a joint on a live line where it is not easy to insulate themselves from the ground, as, for example, when there are no dry boards handy to stand on. In this case, break off a short length of wire solder and wrap it around the shank of a screw driver having a wood or composition handle. The end of the solder then can be touched to the joint or the soldering copper without the possibility of a shock being received through the wire solder.—ERWIN LA HAINE.

# HANDEE

TOOL OF 1001 USES

## This Year Give HIM A HOBBY

Men and boys of all ages satisfy their inherent urge to make scores of useful articles with the famous Handee.

Grinds  
Drills  
Polishes  
Engraves  
Sharpens  
Carves  
Cleans  
Sands  
Cuts  
Saws

### A WHOLE TOOL SHOP IN YOUR HAND

This amazing tool and your choice of accessories do a multitude of jobs on all materials. Set up shop wherever there is an electric outlet. De Luxe Model weighs 12 oz. 25,000 r.p.m. \$18.50 Postpaid with 6 Accessories.

### ULTRA DE LUXE SET

A treasure chest. De Luxe Model and 27 popular Accessories in metal case. This practical gift will be appreciated and used for years. \$25.00 postpaid. Project Book included.

### STANDARD MODEL

20,000 r.p.m. Weighs 16 oz. \$10.75 Postpaid with 3 Accessories.

### 200 ACCESSORIES

Quality built. Largest assortment, one for every job. See at dealers or in catalog.

### GET A DEMONSTRATION

at any store or order either model on 10-Days Money-Back Trial. Catalog Free.

Chicago Wheel & Mfg. Co., 1101 W. Monroe St., Dept. P.S., Chicago, Ill.

☐ Send Catalog ☐ De Luxe Model ☐ Ultra De Luxe Set ☐ Standard Model ☐ Send C.O.D.

Name .....

Address .....

## Handy... Automatic JUSTRITE BLO-TORCH

↑ 10 3/4" LONG OVERALL ↓

**Intense Flame . . . Easy to Handle Operates at Less than 1c per Hour!**

Here's a torch that's "tops" in every way! Handy—easy to carry—small enough to get into tight places. Automatic—no pumps or complicated pressure controls to adjust. Single regulating valve controls flame. An ideal tool for metal craftsmen, electricians, mechanics and plumbers. Does a real job at low cost!

**NO PUMPS—ONLY ONE MOVING PART!**

## 101 USES!

Order your Justrite Blo-Torch today—you'll find hundreds of uses for it. Excellent for working and tempering metal, burning off paint, bending glass, melting glue, thawing pipes, small blacksmithing operations, most all soldering work, and a host of other jobs around shop, farm or home. 100% satisfaction guaranteed—10-day money-back trial. See it at your dealer's or order direct. Shipped either postpaid or C.O.D.

Only **\$2.95** Postpaid Order Yours NOW!

**FREE! SOLDERING IRON POINT** if you order now! Converts Blo-Torch into self-heating soldering iron—can be used anywhere—not dependent upon any other source of heat. Act today!

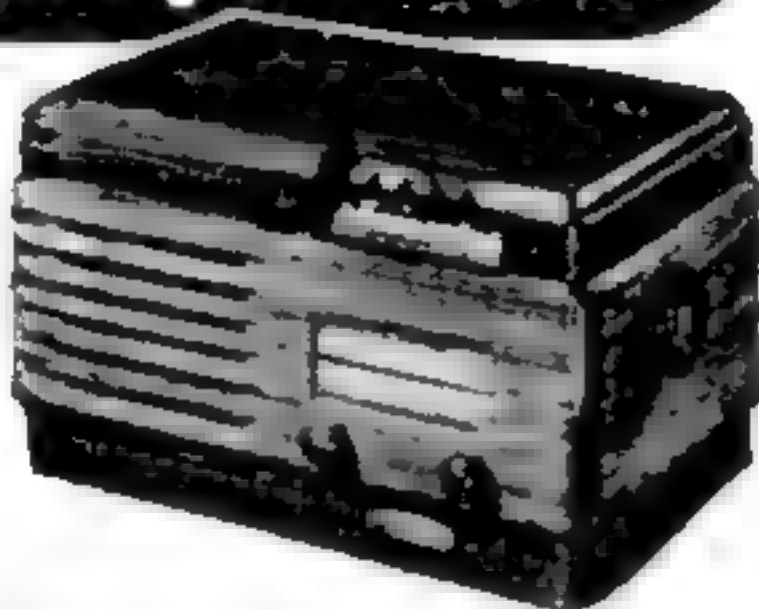
**JUSTRITE MANUFACTURING CO.**  
2052 Southport Avenue, Chicago, Illinois



*Everything in*  
**RADIO**  
*at*  
**LOWEST PRICES!**  
 Sets • Parts • Kits  
 P. A. • Ham Gear • Testers  
 FREE! 180 Page Catalog

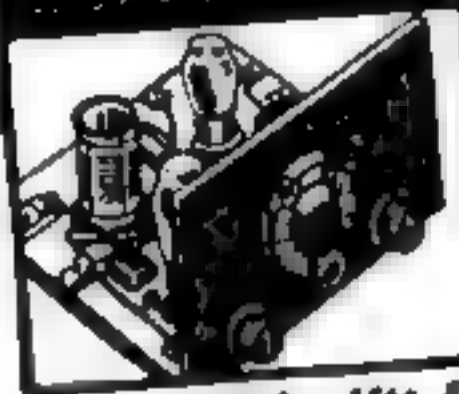
## 1939 KNIGHT SETS at New Low Prices!

See the amazing new 1939 Knight Radios in your ALLIED Catalog! New features—Push-Button Tuning, "Low-Boy" cabinets, 1½ volt tubes, etc.—at new low prices. 62 models, some as low as \$8.95, 4 to 16 tubes, in AC, AC-DC, 1½ Volt, 6 Volt and 32 Volt models. Also new "Tiny Knights", phonographs, phono-radio combinations, record players, etc. They're all in ALLIED's 1939 Catalog—the Buying Guide of Radio Buyers!

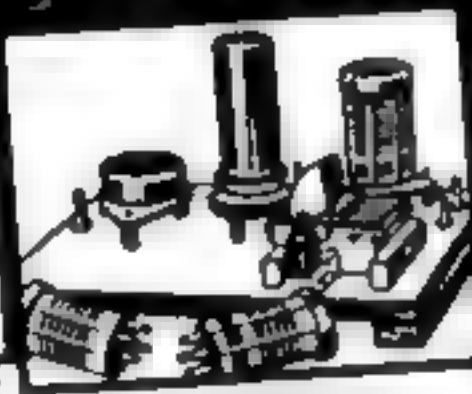


Choose  
from  
**62 MODELS**

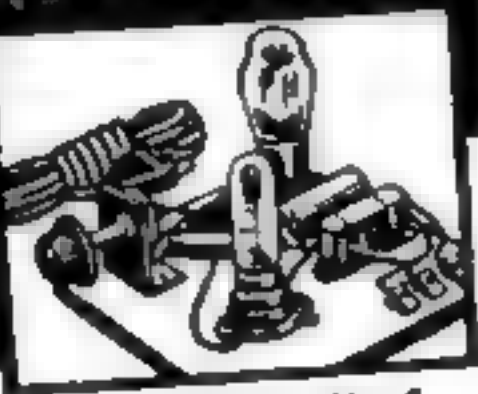
## KITS! Complete-Ready to Build! Send for FREE Parts Lists!



**2 Tube DX'er Kit!**  
The favorite receiver of thousands! Low in cost, efficient, easy to build. Less coils.....\$3.95



**20 Watt X'mitter**  
Advanced type 6LS Beam-Power Transmitter for C.W. Tunes all bands. Complete, less tube, crystal, and key.....\$3.50



**Photo Cell Kit!**  
Ideal for burglar alarms, controlling lights, starting and stopping motors, etc. Complete.....\$5.85



### BEGINNERS! SEND FOR *Allied* RADIO BUILDER'S HANDBOOK

A new and different type of book, planned especially for radio beginners. Tells how to select circuits, read diagrams, make chassis, solder, wind coils, etc. Packed with valuable data. Send coupon with 10c for your copy today! Only 10c.

**FREE PARTS LISTS.** We can supply Free Parts Lists covering hundreds of kits, including those above. Write!

### SAVE MONEY ON ALL YOUR RADIO NEEDS

The new ALLIED Catalog also shows 14,000 radio parts, new P. A. Systems from 8-65 watts, Amateur Gear, Test Equipment, books, tools, etc. Write for your Free copy today—you'll save and profit on every order!



ALLIED Radio Corp.,  
Dept. 7-A-9  
833 W. Jackson Blvd.,  
Chicago, Ill.

- ☐ Send me your Free 1939 Catalog.
- ☐ Enclosed find 10c for Radio Builder's Book.
- ☐ Send me parts list for.....

Name.....

Address.....

## He Builds Fire Engines

(Continued from page 110)

water into the 1,200-foot tunnel, and the loss reached \$100,000 before the flames died down.

A few days later, a railroad engineer called the little shop, saying, "we need a truck for fighting tunnel fires."

"How much water must she carry?" was Smillie's only question.

"All she can."

Smillie drew rough sketches, planned a combination truck and trailer, and delivered the unit a few weeks later. Mounted on flanged wheels, truck and trailer stand on a siding near Jacumba, Calif., ready for a quick dash to any tunnel on the line. Eight hundred gallons of water fill the tanks. The steering wheel of the old automobile is disconnected, and Smillie installed a new transmission so the equipment can roll as fast backward as forward.

As a boy, Smillie tinkered with metal. When he left school a quarter century ago, he decided some day he would conduct his own business. Soon he had a shop in downtown San Diego, where he soldered gasoline tanks and built sirens for state motor-cycle patrolmen. It was then he developed a trick which enables him to apply heat to gas tanks immediately after removing the fuel. "Run the torch across the bottom briefly," is his method, "which warms the vapor and expands it. Stick the flame down into the neck, and . . . poof . . . out she comes. No explosions, no runs, no injuries."

Before automobiles came along in large numbers, he built two-horse milk wagons. Some of these ran up to \$2,500, and were quite elaborate. On hearing of his skill with these jobs, an automobile dealer, stuck with nine small obsolete cars, asked Smillie to build new bodies on them. That was before the day of streamlining, yet his creations were on the modernistic order. Retopped and repainted, the lot sold at \$450 apiece. Three weeks earlier, a purchaser could have had all of them together for the same price.

Between trucks, when not working on some complicated job of metal construction, tiny charger boxes for hearing-aid batteries, or copper-petal flowers, Smillie putters around his shop, making all-metal model ships and play houses.

For rural districts, where traffic officers are virtually unknown, he designed a sheet-metal cop. He stood in front of a panel one day while his wife outlined his figure with chalk. Later he cut out the figure, painted the features and uniform. Now the metal cop stands beside the road to warn motorists.



# "IT TAUGHT THE OLD DOG A NEW TRICK"



"Junior showed us your ad as a Christmas hint," writes W. W. B. "Wanted a Royal Portable for his homework."

"But with your Free Home Trial offer I said 'Why wait?'. So we sent in the coupon that very night."

"Before Christmas Junior was already doing homework easier, faster. And that gave me an idea. . ."



"Typing's a cinch—with a Royal. I work out ideas on it. I get a raise Jan. 1. Happy New Year!"

## FOR CHRISTMAS GIVE THEM THIS BIG FAMILY HELP

A Royal Portable helps you write faster, think faster. It's an opportunity for a better, brighter future—a chance for you, your whole family, to do more, be more! It's the success-full Christmas gift!

**FREE HOME TRIAL!** Try a Royal in your own home. Know all about it before you risk a penny. See exactly how a Royal will help you whatever your job. Then—own it on your own terms—pay cash or . . .

**ONLY A FEW CENTS A DAY.** The easy, modern way to own a Royal. Your choice of four models at four prices—all factory-new, reasonably priced.

**ACT NOW!** Mail coupon today for full details of Royal's offer—all about models, prices, terms—everything. No obligation.



## OWN A ROYAL PORTABLE ON YOUR OWN TERMS

### FREE!

Royal's Instant Typing Chart shows you how to type RIGHT.

INCLUDED with every Royal Portable at no extra cost—a handsome, all-weather Carrying Case

**ROYAL TYPEWRITER COMPANY, Inc.,**  
Dept. C-95, 2 Park Ave., New York, N. Y.  
Tell me how I can own—for only a few cents a day—a latest model Royal Portable—with **FREE HOME TRIAL.**

Name \_\_\_\_\_ Street \_\_\_\_\_

City \_\_\_\_\_ State \_\_\_\_\_



## Wonders Through The MICROSCOPE

A new book which tells you all about MICROSCOPY. Turn an inexpensive microscope on hundreds of specimens within a stone's throw of your front door and you step off into a new world of wonders. Complete Manual for amateurs. How to use equipment, secure and preserve specimens, take photomicrographs, etc. Numerous illustrations. Full cloth bound \$1.00.

**POPULAR SCIENCE MONTHLY, Dept. 19**  
353 Fourth Ave. New York, N. Y.

## GET IN THE SWING with Slingerland . . . DRUMS

## GUITARS MANDOLINS



**GENE KRUPA**—World's Greatest Swing Drummer uses Slingerland

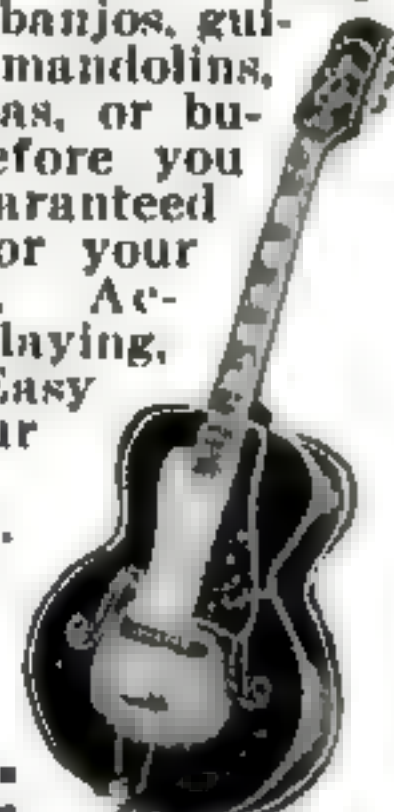
claimed the tops in smooth tone, easy playing, rich power by world's leading musicians. Easy payments. 5-days free trial. See at your dealers.

Cut this ad out—good for \$1.00 credit. Free special information on how to organize drum and bugle corps. Free Catalog—mention instrument wanted.

**SLINGERLAND DRUM CO.**  
1319 Belden Avenue Chicago, Illinois

### NOTHING CORNEY about Slingerland Instruments

Compare the value—tone and power in Slingerland "Radio King" drums, banjos, guitars, mandolins, marimbas, or bugles—before you buy. Guaranteed more for your money. Ac-



**\$150 TO \$300**  
PROFIT MONTHLY WITH  
**Simplified ARC WELDING**

**BUILD A PAYING BUSINESS OF YOUR OWN**  
New low prices on modern 40 Volt Simplified Welder opens big profit opportunities even to the smallest shop.

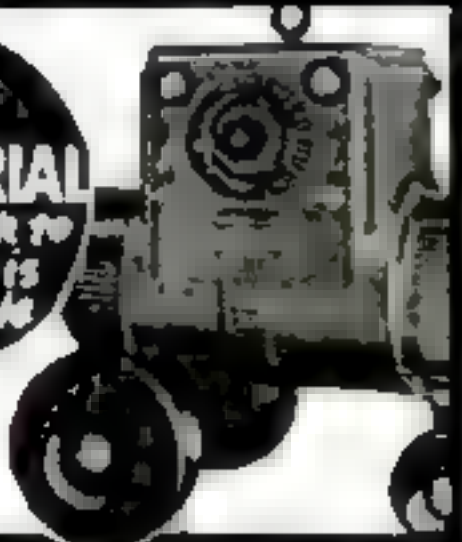
**FREE BOOK**  
"NEW PROFITS FOR WELDING SHOPS"  
Write for it!

**ONLY \$20 MONTHLY**  
will put it in your shop

New Hobart Welder insures easier, faster operation. Extra earnings from new work lets you own without expense to you. 30 Days Trial, at our risk, before you buy. Write today for complete details, no obligation to you. Pay out of increased profits.

**HOBART BROS., Box P-19, TROY, OHIO**

**30 DAY'S TRIAL**  
at our risk to PROVE it is profitable







## TELESCOPES

for THRILLS



ONLY achromatic (color-free) telescope at \$3.75. Brings exciting scenes from miles around close to your eye—clear, sharp. Pocket-size (6 oz.). Rust-proof nickel. Real buy. Magnifies 8 times. Other models up to 45-power. Dealers, or direct, postpaid (or C. O. D.). **WRITE FOR FREE BOOK!** Wollensak Optical Co., 813 Hudson Ave., Rochester, N. Y.

# WOLLENSAK

## CHEMICALS

**5c** C. P. Grade—Generous Quantities **5c**  
... and in glass containers—unconditionally guaranteed!  
**FREE** big fully illustrated valuable catalog—a real 25c handbook. Equip a complete home or professional laboratory with chemicals, apparatus, microscopes and instruments at real bargain prices. Save money! Send 3c for postage. Get your copy NOW!  
**KEMKIT SCIENTIFIC CORP.**  
397-A Bridge St. Brooklyn, New York

## New 40 Page Catalog FREE!

Laboratory Supplies  
Apparatus-Chemicals  
Scientific Books-Telescopes  
Microscopes-Biological Needs

Save Money! Buy direct. Send Now. It's FREE.  
Full of Bargains & valuable information.  
J. H. WINN MFG. CO., Dept. 101, 124 W. 23 St., N.Y.



## CHEMICALS

Laboratory Apparatus and Glassware  
Send 3¢ for Catalog CP1

Dept. M25

**BIOLOGICAL SUPPLY COMPANY**  
1176 Mt. Hope Ave. Rochester, N. Y.

**Gibson**  
GUITAR BOOK  
**FREE**  
Gene Autry  
Popular  
Movie Star

Have fun—be popular  
—make money!  
Play guitar, banjo,  
mandolin, get the  
52 page Gibson Book,  
learn how you can do it.

**PLAY GUITAR!**

GIBSON, Inc. 113 Parsons Street Kalamazoo, Michigan  
YES, I want to have fun, be popular and make money. I am  
interested in ( ) Guitar ( ) Banjo ( ) Mandolin.  
Name \_\_\_\_\_  
Address \_\_\_\_\_  
City \_\_\_\_\_ State \_\_\_\_\_

## Gas Chemistry for the Home Experimenter

(Continued from page 195)

decompose the cupric chloride, forming chlorine gas, water, and another copper compound called cuprous chloride. The water condenses on the upper walls of the test tube, while the chlorine issues from the side outlet, and may be led through rubber tubing where needed.

With this miniature chlorine generator, you can strikingly demonstrate the bleaching power of chlorine gas. An ordinary photographic print, either wet or dry, will become entirely bleached if you hold it in a stream of chlorine gas issuing from the test tube. The tiny black particles of silver that form the image are converted to white silver chloride.

An entertaining bit of chemical magic—changing one picture into another—may be performed with the same apparatus. Draw a picture or cartoon, using a water solution of one of the many household dyes that can be bleached by chlorine gas for your ink. On the same sheet of paper, draw another cartoon with colorless or "invisible" ink, made by heating a weak potassium iodide solution to which a bit of starch has been added.

Now place the sheet of paper in a jar and expose it to a stream of chlorine gas. Soon the drawing made with the household dye fades from sight. In its place appears the second drawing, clearly outlined in black lines wherever you have traced with the "invisible" ink. The chlorine gas liberates iodine from the potassium iodide, and the iodine reacts with the starch to produce a dark coloration.

Under suitable conditions, chlorine gas torn from cupric chloride will recombine with copper. You can juggle the process back and forth, ending with a shiny coating of copper.

Roll some copper screen or several copper wires into a bundle, and insert this in a piece of glass tubing about a quarter of an inch in diameter and four to six inches long. Connect the tubing to the outlet of your side-necked test tube, or to an ordinary test tube fitted with a one-hole stopper and a piece of tubing for a gas outlet. Place a little cupric chloride in the tube and heat it as before, while another burner plays upon the tubing holding the copper.

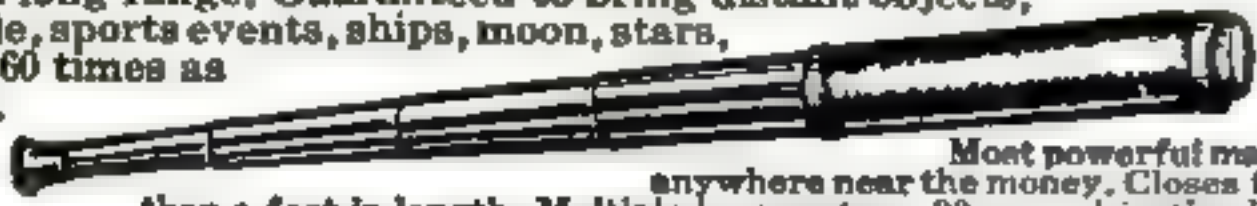
First the chlorine gas will recombine with the copper in the heated tubing, and then the compound will be decomposed by the flame playing along the tubing. Now, if you hold the burner at the end of the tubing, a beautiful bluish-green flame will appear, formed by the recombination of copper and chlorine. Hold the cold bowl of a clay bubble pipe in this flame, and a coating of metallic copper will form upon it.



## 60 POWER TELESCOPE...\$219

VARIABLE EYEPIECE 20X-40X-60X

**NEW!** Three telescopes in one. 3 different magnifications. 20 power for ultra-bright images with 40 and 60 power for extra long range. Guaranteed to bring distant objects, people, sports events, ships, moon, stars, etc., 60 times as close.



Most powerful made for anywhere near the money. Closes to lens than a foot in length. Multiple lens system. 30 mm. objective lens. 6 sections. Directions included for using as a compound 4 lens microscope. American made. We pay the postage. Only \$2.19.

## 1400 POWER MICROSCOPE . . . . \$18.75

Most powerful amateur microscope made. All refinements including photographically corrected achromatic lenses. Adjustable to all powers 160x to 1400x. Rack & pinion focusing, concave mirror, adjustable stand, height 11 inches, prepared and plain slides, wood carrying case, 100% American made, only \$18.75.

Catalog of Microscopes, Binoculars, Telescopes FREE on request. BROWNSCOPE CO., Dept. 61, 5 W. 27th St., New York, N. Y.

## ENGINES

A real money maker for farm or factory. Uses Cheap fuels. Pays for itself out of savings. Costs Less to Own—Less to Operate.



## LOG SAWS

Make Money—Start a wood sawing business—turn spare timber into cash. Cash or Terms—Engine and Saw Catalog.

WITTE ENGINE WORKS  
2221 OAKLAND AVE. KANSAS CITY, MO.

## GRANDFATHER'S CLOCK, LOWER PRICED

Our newest offering, at an unheard of price for a faithful reproduction of a real Grandfather's Clock. Scroll top, narrow waist, like picture. Shipped Knock Down. Cleverly designed. Easy to assemble. Others even cheaper. Plans 10c, Catalogue FREE.

AMERICAN CHIME CLOCK CO.  
1642 Rutter St. (Established 1877) Philadelphia, Pa.

## POWER TOOLS AT LOWER COST

also Model Makers and Accessories

FREE CATALOG ARCADE MFG. CO.  
1218 Shawnee St., Freeport, Ill.

# Every Man Out of a Job CAN NOW Go Into BUSINESS for HIMSELF!

Write to Popular Science Monthly about this plan which puts you into your own business. Be our representative. Get our wholesale rates and see how you can really make money taking subscriptions for Popular Science Monthly. Nearly half a million men now read this fast growing magazine. Show your copy to others and take orders. Every order gives you a real good profit. Some agents travel all over on their profits and pile up good bank accounts too. Write and get details of this good business plan. You will be surprised at the money you can make.

## SIGN AND SEND THIS COUPON

Popular Science Monthly  
353 Fourth Avenue, New York

Dept. 19

Tell me how I can make money representing Popular Science Monthly.

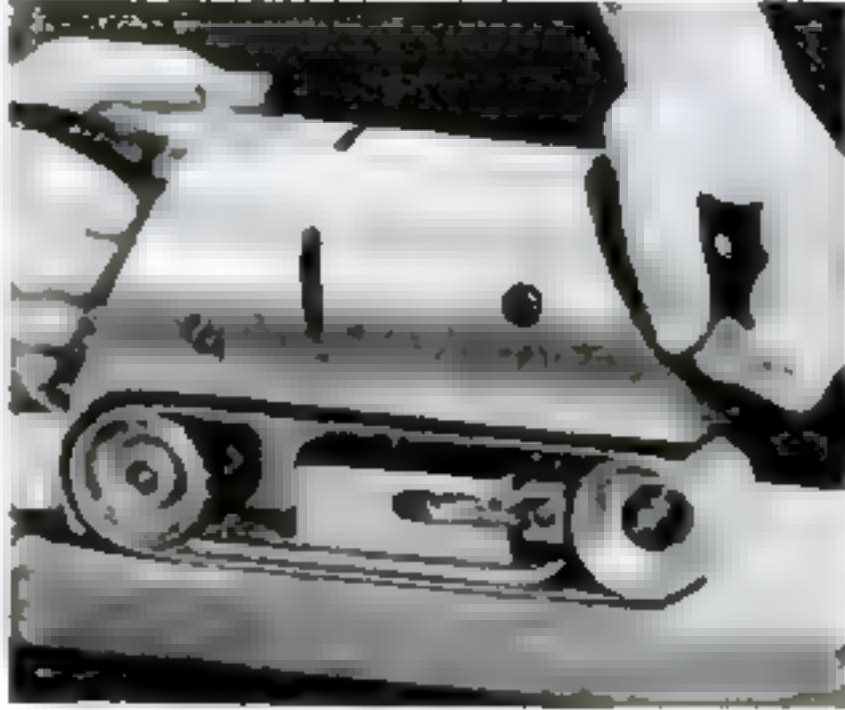
NAME .....

ADDRESS .....

CITY ..... STATE .....

## SAND 10 TIMES FASTER

— get Better jobs this Easy way!



SANDS—GRINDS  
POLISHES  
BUFFS—SHARPENS  
REMOVES PAINTS,  
VARNISHES,  
LACQUERS

## New Guild Sander

PORTABLE

ELECTRIC

Do your sanding jobs 10 times faster with this handy little portable power sander. It's easier. Ends all the drudgery of hand sanding. Anyone can use it without practice.

Driven by a powerful motor, the endless abrasive belt sands with the grain. Leaves no ugly swirls, no cross-grain scratches. Gives uniform finish on flat surfaces . . . is handier around curves. Sands wood, wall board, metal, slate, marble, bone or plastics.

GuildSANDER is a popular-priced precision tool—with a 5-year guarantee. Works from any light socket. Weighs only 9 lbs. Try it at your hardware dealer's, or write direct for details.

SYRACUSE GUILD TOOL COMPANY  
1700-1B N. Salina St., Syracuse, N. Y.



## Print Your Own

Cards, Stationery, Advertising, labels, paper, circulars, tags, etc. Save money and time. Sold direct from factory only. Junior Outfit \$8.00, Senior Outfits \$17 and up. Do popular raised printing like engraving with any of our presses. Print for Others, Big Profits. Pays for itself in a short time. Easy rules sent. Write for free catalog of outfits and all details. Kelsey Presses, E-33, Meriden, Conn.

## Greatest VALUE EVER OFFERED

BRAND NEW

## featherweight

1938 Model

PORTABLE

only  
\$39.50  
CASH



Typing  
Course  
Included

or On Easy Terms

## SEND NO MONEY—10 DAY TRIAL

Positively the biggest value ever offered—the perfect family portable—100% efficient. Latest streamline with 14 distinctive features, many found only on higher priced models selling at \$64.50. NOT A JUNIOR MODEL. Unconditionally Guaranteed. Simple and compact—sturdy construction—silently smooth and swift. Carrying case included. See it At Your Dealer or Use Coupon Below.

INTERNATIONAL TYPEWRITER EXCH.

Dept. 107

Franklin and Monroe Sts., Chicago.

Please send the Deluxe FEATHERWEIGHT Portable F. O. B. Chicago, on 10 days Trial. If I decide to keep it I will pay \$39.50 cash or \$3.00 a month until \$42.50 term price is paid. Or, if I am not perfectly satisfied I can return it within the 10-day trial period. For quick shipment give references and occupation.

Name .....

Address .....

City .....

State .....





*for Christmas*

**A  
MICROSCOPE!**

A lifetime of thrill and excitement awaits the nature and science enthusiast who finds a microscope among his Christmas gifts. Bausch & Lomb microscopes are known 'round the world for their scientific dependability. Shown here, model R, 72 to 300 diameters, complete in walnut case, \$19. With \$5 455-page book, "Adventures with the Microscope," \$21. Other amateur and professional microscopes, \$14.50 to \$774.50. Write for free literature.

**Bausch & Lomb**

240 BAUSCH ST. . . . . ROCHESTER, N. Y.

**NEW BENJAMIN AIR PISTOLS  
WITH MULTIPLE LEVER  
HAND PUMP FOR TARGET-  
SMALL GAME-CAMPING-ETC.**



**Guaranteed-Accurate-Practical-Economical-Safe-Clean-Quiet. Adjustable Force-Amazing Maximum Velocity. No smoke or fumes. Bolt Action-Hammer Fire-Hair Trigger-Safety Lock-Hand Pump. Single Shot BB \$8.50; Single Shot cal. 177 or 22 with rifled barrel \$8.50; BB 8-Shot \$10.00; Holster \$2.00. Also a complete line of Benjamin Genuine Compressed Air Rifles for BB and cal. 177 or 22. No license required from dealer or factory. Ask for complete specifications and Free Targets. BENJAMIN AIR RIFLE CO., 852 Marion St., St. Louis, Mo., U.S.A.**

**WRITE  
TODAY**



**REAL THRILLS  
IN MICROSCOPY**

.....EASY  
INEXPENSIVE  
HOBBY.....

**WELCOME  
CHRISTMAS  
GIFT!**

**NATURE'S** hidden miracles clearly revealed through this Wollensak microscope—only microscope with 425 power for \$20. Magnifies from 100 to 425 diameters, in steps of 25. Easy to use. Ideal for photomicrography. Also 425 150-power at \$14.50—magnifies from 70X to FREE 150X. At stores or BOOK! direct, postpaid (or C.O.D.). Money-back guarantee. Send for **\$20 FREE BOOK.**

Wollensak Optical Co., 807 Hudson Avenue, Rochester, N. Y.

**WOLLENSAK**

## Your Microscope Reveals Marvels in Common Foods

(Continued from page 201)

of xylol, carbon tetrachloride, dry-cleaning fluid, or other grease solvent, for a minute or two. Then proceed with the other steps as outlined. (For further information on bacteria see P.S.M., Dec. '37, p. 100.)

Don't be alarmed if you find numerous bacteria in the family milk supply. Even milk that comes from a first-class pasteurizing plant contains them, including the disease-producing varieties; but they are dead and therefore harmless. Pasteurizing kills bacteria but does not remove them.

If the cook happens to be cleaning a chicken or other fowl while you are exploring the kitchen, you can obtain some interesting blood specimens. Simply place a little blood on a clean slide—or, preferably, three or four such slides—and spread it out into a thin film with the edge of a square cover glass or another slide. Let it dry and fix it by immersion in absolute alcohol for a few minutes; or simply wave the slide through the air until it is dry. Stain if desired, preferably with Giemsa or other standard blood-staining solution.

The bones of beef, chickens, and other animals used as food offer possibilities. Longitudinal and cross sections can be made by methods described previously in this series (P.S.M., March '38, p. 96), and their structures studied.

Kitchen specimens for your microscope are almost numberless. With your magic lens, you can study the bacteria in dish water, the algæ and other bits of matter you can filter out of tap water, the muscle fibers and other things in the tissues of beef, fowl, and other food animals; some of the strange characteristics of feathers, the secrets of pastry flour and starch—and, speaking of starch, scrape the surface of an Irish potato with a knife, spread some of the milky fluid on a slide, and look at it. The little oval things you see are starch grains; and if you have polarized-light equipment, you will find that each of them shows the characteristic dark cross, by which microanalysts identify starch in unknown food samples.

## Bubbles in Slow Motion

SLOW-MOTION movies of air bubbles rising through water, exhibited recently before a meeting of scientists, revealed that the bubbles are not spherical as is commonly believed. Drops of water bouncing around inside create waves on the surface walls of each bubble.

Please mention POPULAR SCIENCE when writing to advertisers.



## HARD-TO-GET MATERIALS

Just out—Our twenty-fourth annual catalog of Hard-to-Get Materials for Homecrafters, Schools, Institutions, Antique, Novelty and Cabinet Shops. Most complete line in entire country on this class of supplies. Send 10c in cash or stamps today. (Partial list) Chest hardware, locks, hinges, supports, casters, copper trim, etc., also mldgs., overlays, etc. Finishing materials glue, stains, varnish, wax, flint and garnet papers, rubber sanding blocks, stick shellac, burning-in knives, etc. Upholstering supplies and coverings. Complete line of electrical findings for lamp manufacture, also cluster and indirect fixtures. Chair cane, woven and in strands, spline, reeds, fibre cord, etc. Trays for smoking stands and glass liners. Large line electric and spring clock movements, with and without dials. Complete line Venetian Blind hardware, tapes and cords. Table slides and leaf supports. Tea wagon wheels and casters. Wood dowels, also dowel screws, dowel centers, wood screw hole buttons. Excellent line card table leg supports. Bed hardware of every description. Desk pens, complete with funnel and fastening, without base. Water transfers, inlays, small mouldings, etc. Furniture glides and casters. Office chair spiders, wood legs and K. D. chair frames. Small box hardware of every description. Large selection pulls, knobs, handles, hinges, locks, catches, etc. Perforated steel panels, chair braces, revolving chair fixtures, rocker springs, candlestick sockets, bill board clamps, banquet table equipment, many sizes braces, corner irons, hanger bolts. Step ladder braces, plaster strips, sliding track and sheaves. Typewriter desk hardware, bin swings, mirrors, nut bowl hardware. Bar pins for novelties, Catalin Plastics.

**THURSTON SUPPLY CO.**

Department P. S.

Anoka, Minnesota

## RUPTURED?

### Get Up-To-Date Relief

Why try to worry along with old-fashioned trusses that gouge your flesh—press heavily on hips and spine—enlarge opening—fail to hold rupture? You need the Cluthe. No leg-straps or harness. Automatic adjustable pad seals opening—follows every body movement with instant increased support in case of strain. Cannot slip. Holds rupture whether at work or play. Light, easy to wear. Waterproof. Can be worn in bath. Send for amazing **FREE** 100-page, cloth-bound book "Advice To Ruptured" and details of liberal truthful 60-day trial offer. Also names of grateful patrons in your neighborhood. Write today. Cluthe Sons, Dept. 14, Bloomfield, New Jersey.

When Writing Advertisers  
Please Mention **POPULAR SCIENCE**



**Christmas Seals**  
help to protect your home  
and family from tuberculosis

**BUY and USE them**  
on your Holiday mail

The National, State and Local  
Tuberculosis Associations in the United States

## New Oil Heater by

# LACO



**LOW \$23.50**  
**AS**

**Beautiful! Durable! More Heat!**

Now—a really sensational heater . . . one of the most attractive and durable we have ever built—now yours at the **Lowest Price in LACO history!** Installs like a stove—needs no basement. LACO's famous Two-Stage, Double-Flue burner capable of developing tremendous heat! Perfected LACO Inner-Heating-Unit utilizes utmost of the heat. Equipped with easy heat-regulator. Quiet. Safe. Circulates and humidifies the air. Beautiful lifetime steel cabinet. Your choice of sizes.



### Newest LACO "Gun-Type" Burner

Now you can save money—have LACO's newest, finest pressure-type oil burner! New simplicity, new quietness, new fuel economy, new Low Price! Exclusive LACO features transform low-priced heavy oil into finest mist for extra rich mixture, extra hot flame, no waste! Results of 12 years of burner building. **GUARANTEED.**

**WRITE** Rush card for new free illustrated booklet giving complete details and illustrations of my Low Priced LACO Heaters and burners. **L. A. COCKLIN, Pres.**

**LACO OIL BURNER CO.** 719 Union Ave.

Griswold, Iowa

## NEW Grinding Attachment

**For 8" to 16" Metal Lathes. Build It Yourself.**

At last, a precision grinder within your means. You save 23 by finishing our semi-machined castings, on your own lathe. **HURON** handles both *internal* and *external* grinding. Accuracies to .00025". Mirror finish easily obtained. Grinds valves, pistons, bushings, shafts, hard or soft, holes, lathe centers. Sharpens reamers, milling cutters. Does eccentric drilling; taps; polishes; scores of other uses, for home workshops, garages, machine shops. Write for **FREE** illustrated folder and full information.

**Huron Machine & Tool Co., Dept. C-1, Yale, Mich.**

Only \$5.98



## PRACTICAL MAGNIFIERS

**FOR EVERY PURSE AND PURPOSE**

Sizes 1 1/2" dia. to 5" dia. lens. Prices, 50c to \$10. Send for **FREE** Catalog of these attractive, well-built instruments.

**Dealers' Inquiries Invited**



**THE MAG-NI-LINE PRODUCTS**

3456 E. Jefferson

Detroit, Mich.

### BUILD 18 INCH MODEL CABIN CRUISER



Fascinating and instructive Model Boat Building for pleasure and profit leading to highly paid Profession. Send Dime for further information.

WOOD PARTS ready to assemble \$1.96. Send Money Order.  
**SYKES MOTORS CO. RAMONA AV. LAKEWOOD, OHIO**

## YOU CAN BUILD A MODEL AIRPLANE THAT FLIES 2 MILES

**THE ORIOLE**  
\$1 POST PAID

50" WINGSPAN

**COMPLETE MATERIAL AND INSTRUCTIONS** with many finished parts, including propeller and wheels. **EASILY BUILT IN A FEW HOURS.**

**SCIENTIFIC MODEL AIRPLANE COMPANY**  
**DEPT. Z, 218-220 MARKET ST., NEWARK, N. J.**



# You'll Like Alka-Seltzer Too!



I LIKE  
ALKA-SELTZER  
FOR  
HEADACHES



I LIKE  
ALKA-SELTZER  
FOR A SOUR  
STOMACH



I LIKE  
ALKA-SELTZER  
FOR ACID  
INDIGESTION



I LIKE  
ALKA-SELTZER  
FOR RHEUMATIC  
ACHES and PAINS

## Try This Easy Way to Pleasant, Quick Relief

● An Alka-Seltzer Tablet in a glass of water makes a sparkling alkalizing solution, containing an analgesic (sodium acetyl salicylate). When you drink it, it gives relief in TWO ways—quick relief from the pain and discomfort and relief from the excess acid condition so often associated with common ailments.

AT ALL DRUG  
STORES  
30c—60c  
Plus.

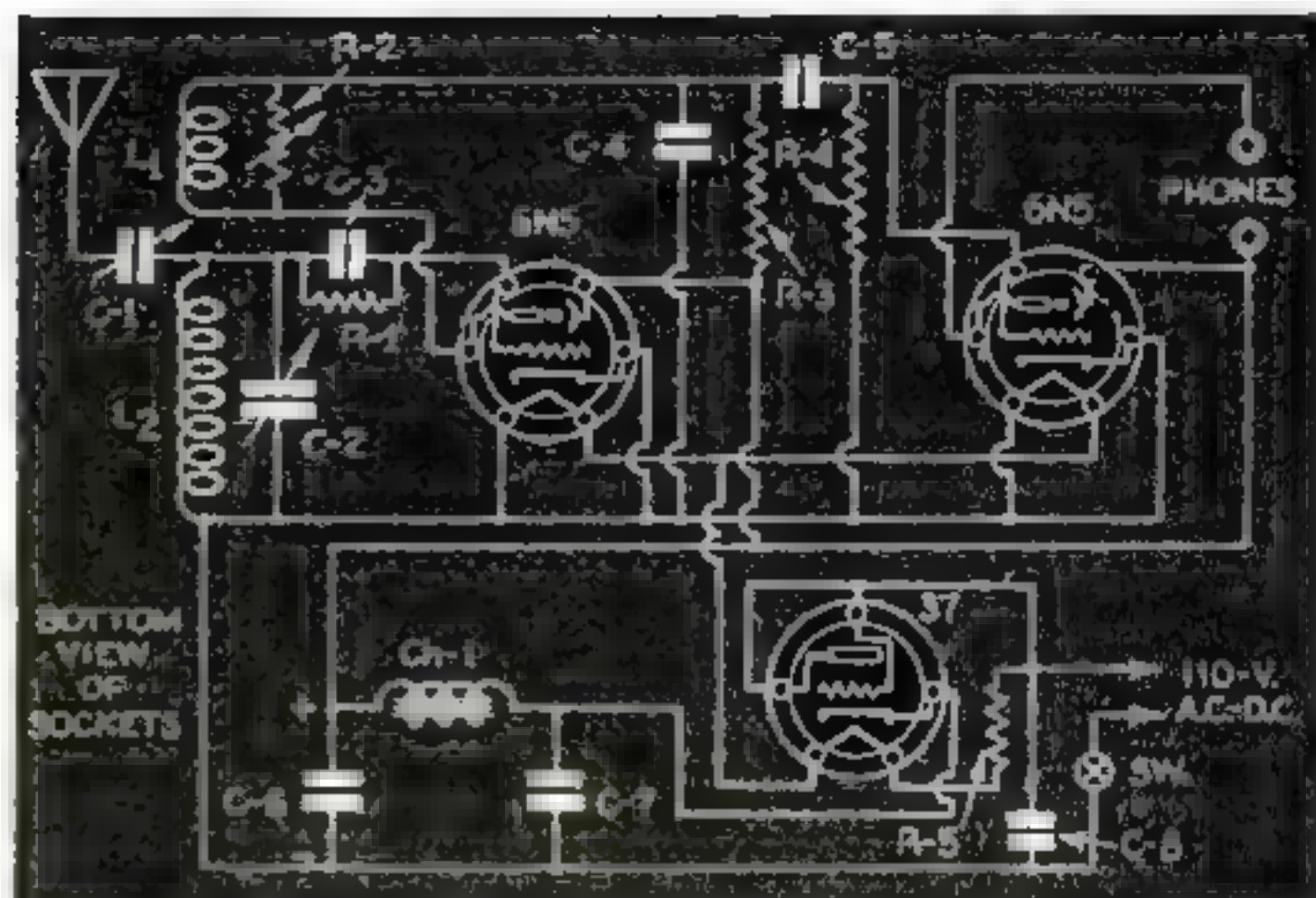


## Boys—Men! Get This Fine GIFT!

Radio-Electrical EXPERIMENT KIT

Only \$3.99  
6 Books FREE

25 UNITS genuine salvage commercial apparatus with fine experimental manual! BUILD radio circuits, 110-volt AC motor, eaves-dropping phone, thief detector, powerful arc light, ultra-violet rays, arc furnace, scores more! Used world wide! Learn at home! SEND ONLY \$3.99 for Special Deluxe Kit and 6 FREE fine Electrical Radio books. Books alone worth \$3.00! Sent C. O. D. if desired. Stamp brings Bargain Catalog! ELECTRICAL SALVAGE CO. Box 524-S1 Lincoln, Neb.



## This Radio "Winks"

(Continued from page 207)

hook-up of this type. The tube has a .15-ampere, low-drain heater, so the heaters of the two 6N5's are connected in parallel, thus equaling one .30-ampere tube. The parallel arrangement permits wiring the tubes in series with the third tube, a .30-ampere type 37, using a standard-size line-cord resistor. The type 37 plays no part in the signal portion of the circuit, but acts as a power rectifier to provide the "B" voltage.

The tuning-eye tubes must be mounted horizontally. This is accomplished by using a second panel parallel to the front one to support the standard six-prong sockets (not the special ones designed for these tubes). Both panels are of a composition wood.

The dual filter condenser is mounted on the back of the rear panel. The filter choke (Ch<sub>1</sub>) is on the inside of the rear panel. Below, on the baseboard, are the tuning condenser, coil, antenna trimmer condenser, plate condenser, line-filter condenser, and the socket for the type 37 tube.

### LIST OF PARTS

- C1—Trimmer condenser, 3-35 mmf.
- C2—Variable condenser, .000365 mfd.
- C3—Fixed condenser, mica, .00025 mfd.
- C4—Fixed condenser, mica, .0005 mfd.
- C5—Fixed condenser, paper, .05 mfd.
- C6, C7—Dual filter condenser, 10 mfd., 200 volt.
- C8—Fixed condenser, paper, .02 mfd.
- R1—Resistor, 2 meg.
- R2—Variable resistor, 0-25,000 ohm, with switch (Sw).
- R3, R4—Fixed resistors, 250,000 ohm, ½ watt.
- R5—Resistor (in line cord), 360 ohm.
- L1, L2—Midget solenoid radio-frequency coil. (Remove two thirds of primary windings.)
- Ch1—Filter choke, 15 henry.
- Miscellaneous:—Tube sockets, wire, panels, phone jack, etc.

Please mention POPULAR SCIENCE when writing to advertisers.



SEE & HEAR  
HOW SCIENCE  
STOPS THIS GANGSTER



IN ANOTHER GREAT RELEASE OF  
**POPULAR SCIENCE-ON-THE-SCREEN**  
AT YOUR LOCAL THEATRE



PRODUCED IN CINECOLOR BY FAIRBANKS AND CARLISLE WITH THE COOPERATION OF THE  
EDITORS OF POPULAR SCIENCE MONTHLY. DISTRIBUTED BY PARAMOUNT PICTURES.

Copyrighted material



# Duro HAND GRINDERS FOR GREATER VALUE

- POWER
- SPEED
- PRECISION



**So Good You Wouldn't Believe  
It Could Be Priced So Low!**

POWER—SPEED—NEW DEPARTURE BALL BEARINGS—  
GENERAL ELECTRIC UNIVERSAL MOTOR—STREAMLINE  
DESIGNING—COMPACTNESS AND RIGIDITY.

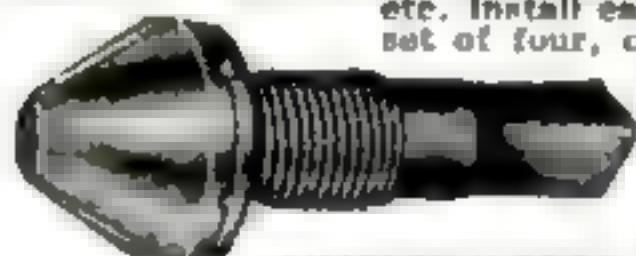
These and many other features are a matter of specification or apparent to the eye, but the performance so far surpasses previous expectations of Grinders in this field that it is hard to realize that such a fine tool could be sold at such a low price. See these Grinders and accessories at your dealers or send for full descriptive circular showing the many operations that can be performed. With these accessories a new field is opened for high class Routing, Shaping, Carving, and hundreds of other uses in woods, metals and plastics. Send your order on 10-day money back guarantee trial.

SEND FOR NEW 1939  
DURO WOOD WORKING  
CATALOG...  
Featuring  
America's  
Finest & most  
Complete line

**DURO METAL PRODUCTS CO.**  
2659 NORTH KILDARE AVE. DEPARTMENT H2  
CHICAGO, ILLINOIS

## ELIMINATE FORD BRAKE TROUBLES

Your Ford has more brake area than heavier, higher priced cars but needs **SIMPLEX FLOATING WEDGES** to eliminate fadeout, adjustments, groans, etc. Install easily yourself. All models, 1928 to 1938. A set of four, one for each wheel, all for \$1.75. Return your old screws for 50c credit. The best brake job you ever had, and costs only \$1.25. Send for a set today. C. O. D. if desired. They must satisfy or your money will be refunded. Descriptive circular sent on request....Agents Wanted.



**SIMPLEX WEDGE EXCHANGE, Dept. P2-1**  
613 Jefferson Street Ottawa, Illinois

# How to work in Wood



**1939 Catalog 10c  
Only.....**

This experts' catalog (1939 edition) also contains a **GUIDE for beginners**. Shows how you can start right in with the simplest tools making beautiful furniture. Wonderful hobby. Profit maker, for spare or full time. See catalog No. 11!

**CRAFTSMAN WOOD SERVICE CO., 2721 S. Mary St., Chicago**

In the 136 pages of this catalog you get the latest knacks in Wood Working, the up-to-date correct processes of finishing, complete directions for Craftsman's new art Inlay method (so easily learned), lists of extra rare, fancy woods from Africa, Australia, East India and elsewhere and how best used.

Also, 235 brand new scroll saw patterns, —yes, 235 (66 others; total 301).

Also, page after page of real **BARGAINS** in extra-rare foreign woods, complete lists of all standard American Woods, cut to convenient sizes without waste, figured Veneers, Plywoods, logs, arms, ornaments, inlays and overlays, hardware and miscellany of all kinds, etc.

**WOODWORKERS:** Be sure to study this remarkable 136 page 1939 catalog No. 11. You need it. Yet its only 10c. Write today.

## Gas-Line Grief

(Continued from page 142)

right, think of pretty nearly everything else on earth before they think of the gas line. Once I saw a fellow take his engine pretty well apart—and get everything out of adjustment—trying to find out why he couldn't get a kick out of it. And what was the trouble? The vent hole in his gas tank had got stopped up! When that happened, of course no air could get into the tank to replace the gasoline that was used, the gasoline flowing out created a vacuum in the tank, and the vacuum finally stopped the flow of gas to the carburetor. He could have located and cured the trouble in ten minutes—if he had gone about it in the right way."

"What's the right way?" Joe asked.

"A gasoline engine can't run if it doesn't get gas," Gus said. "So whenever an engine won't start, or stops after it has started—especially if the explosions get weaker and weaker until it stops—it's only common sense to make certain that the engine is getting gas before you go looking for some other cause of it stopping.

"When an engine won't start, and the battery is strong and the starting motor spins, the gas line should be checked right away!


"First of all, the tank should be examined to make certain that there is gasoline in it. Gauges sometimes get out of order, and don't tell the truth. If there is gasoline in the tank, find out whether it is flowing to the carburetor. You can do that by disconnecting the gas pipe from the pump to the carburetor. If that's clean, get some one to watch for you while you step on the starter. If gasoline is reaching the carburetor, it will flow from the pump when you do that. If it isn't, the trouble almost certainly is a clogged fuel line, or vacuum tank, if your car has one, or a busted gas pump.

"Check the fuel line first. See that the vent hole in the gas tank isn't clogged. If it is open, take a careful look at the filter screen—if there is one—at the bottom of the tank. It may have become clogged with dirt or sediment. Then check the standpipe through which gasoline is drawn to the vacuum tank. It may be either clogged or cracked.

"If the gasoline tank is all right, take off the gasoline pipe and clean it—either by blowing it out, or by running a wire through it. Check the unions between the gasoline and vacuum tanks. They leak sometimes, too.

"If the gasoline pipe isn't clogged, and its  
(Continued on page 240)





**AMERICA'S MODEL SHIPYARD BUILD Boucher MODELS**

The most acceptable gift for the Ship Model builder. Over 100 BOUCHER KITS—Priced from \$3.00 up. Send 25c for 2 big books.

**BOUCHER 126 LAFAYETTE STREET NEW YORK, EST. 1905**

**KINKADE GARDEN TRACTOR**  
and Power Lawnmower

A Practical Power Plow and Cultivator for Gardeners, Suburbanites, Florists, Truckers, Nurserymen, Fruit Growers

**Low Prices - Easy Terms**

**American Farm Machine Co.**  
1072 33rd Av. SE. Minneapolis, Minn.



Catalog Free

**AFTERNOONS FREE**

for life's pleasures. Drive to Country or go to Movies afternoons. Work mornings till noon at HOME. (Business Plan No. 4). Further Outstanding Possibilities: Plans No. 44, 73, 119. Grab the chance to get into a business while it's not yet overcrowded. Write NOW in time for a happy future. Prepare for surprise.

**Stamford Co., Dept. 12-M, 3762 Broadway, New York**

**IT'S EASY TO MAKE BIG SPARE TIME MONEY**

Send for our free plan on how to make \$5.00 to \$15.00 a week in your spare time by taking orders for the NEW POPULAR SCIENCE MONTHLY from your friends. No selling required. Turn extra hours into extra dollars.

**POPULAR SCIENCE MONTHLY**  
353 Fourth Ave. New York, N. Y.



**Remember**

The work of

**The Salvation Army**

For the poor and needy at this

**Christmas-Time**

**Remember**

The services of The Salvation Army every day of the year

**Remember**

**The Salvation Army In Your Will**

Donations may be sent to or information secured from

**COMMISSIONER EDWARD J. PARKER**  
National Secretary

122 West 14th Street, New York City



**Presents**

**2 NEW and IMPROVED POWER TOOLS**



**HELMET-HEAD DRILL**

New. Far different than others. Loaded with features. Fully enclosed drive at no extra cost.

6 Spline spindle. No ordinary splines either but newest involute type. Handsome. Ultra Modern. Dozens of other features. See our catalog!



**FINER TILTING-ARBOR SAW**

Boice-Crane again leads the Tilt-Arbor Saw field featuring exclusive new Rip Fence with single control handle. Rolling Pulley Drive still outperforming all others.

Most Complete Line in America. 19 Machines. 11 Types. All Quality Built.

**SEND FOR 1939 CATALOG**

**BOICE-CRANE CO., Dept. 319, Toledo, O.**

Catalog FREE. Spinning Handbook 10c.

Name.....

No.....

City..... State.....



**If You Want to Be A BETTER CRAFTSMAN**

**Get the Right Saw For the Job**



• Often the finished job that looks best comes from knowing which saw to use, rather than better handling of the tools. A single hand saw is not an all-purpose tool. A rip saw does its particular job better than a cross cut would, and vice versa, while several others are each best for certain work. The right saw is an Atkins, and which type to use is explained in a helpful booklet. Send 10c for the "How To Do It Book."

**E. C. ATKINS AND COMPANY**  
428 So. Illinois St., Indianapolis, Ind.



**ATKINS**

*Silver Steel*  
**SAWS**





**EASY to play**

With an easy playing Conn band instrument, you can be ready for band or orchestra in 4 to 6 weeks. A sure road to popularity if you start on a Conn. Choice of the world's greatest artists. Magnificent tone. Many exclusive features—yet they cost no more. Ask to see the marvelous new models now being displayed by Conn dealers.

**WRITE FOR THIS NEW FREE BOOK**

Home trial, Easy payments. Write us for free book on whichever instrument interests you most. Mention instrument.

C. G. CONN, LTD., 132 CONN BLDG., ELKHART, IND.

**CONN**

BAND INSTRUMENTS

**NOW, A REAL 10" SLIDE RULE FOR 95c**

with A, B, C, C1, D, K, L, S, & T scales. No wood, white face, Stainless Steel Runner. Special introductory price for Pop. Sc. readers. Send 95c M.O. to DECO CO., 43 Lexington Ave., New York City. Real leather Case 25c extra, money return guaranteed if not satisfied.

**PHOTO-MOVIE BARGAINS** Jan. SALE: Bell & Howell, Speed-Graphic, Kodak, Keystone, other new & used Movie and Photo equipment. 16mm Victor-RCA Sound Projector complete \$125.00. Time payments. Liberal allowance on old equipment. Sound, Silent Movie Rental Library. FREE membership. Projectors, Enlargers, other specials. Xmas List free. 66 W. 48th St., New York, N. Y. **MOGULL'S**

**\$1.00 POSTPAID**



**SIX SCOTTIES TO WHITTLE**

A brand new Kit containing material for whittling SIX interesting little Scottie dogs, each in different characteristic pose. Each Scottie is about 2 inches long and the six wood blocks supplied, are ready cut to the correct outline. Nothing else needed but a pocketknife. Complete Kit containing 6 shaped blocks, paint and brush, pocket sharpening stone, material for eyes, and complete illustrated step-by-step instructions will be sent for only \$1.00 postpaid in the United States or Canada. Get started in this new Hobby NOW. It's easy with this new Kit.

**POPULAR SCIENCE MONTHLY** Dept. 19  
353 Fourth Ave. New York, N. Y.

**Give Books for Christmas! Be sure to see the Special Announcement on pages 246 and 247.**

## Gas-Line Grief

(Continued from page 238)

unions are tight, the trouble most likely is in the vacuum tank.

"Open the drain cock at the bottom of the tank, and run a wire through it. If no gasoline comes out, there is none in the lower chamber. Check the strainer at the top of the tank. If it isn't clogged, examine the flapper valve in the lower chamber. Sediment may be holding it open.

"As for the gas pump, you've taken plenty of those apart," said Gus, who hadn't even slowed down a pace as he talked and worked at his bench. "One thing to remember always is not to bother to repair anything on it. Take it apart and give it the once over. New parts are cheap, and you can save money for all concerned by simply replacing the parts that are broken or worn out with new ones."

## Radio-Static Suppressor Is Designed for Planes

MEASURING only two by six inches, a new-type static suppressor has been designed for use in airplanes when static impedes good radio reception. The device consists of a cylinder fixed to one end of the horizontal stabilizer. It contains a five-foot coiled wire, grounded to the plane at one end. If conditions warrant, the wire coil is released electrically by the pilot, becoming in effect a trailing antenna with a sharp point at the end through which static electricity is automatically discharged into the air, instead of into the sensitive radio apparatus.

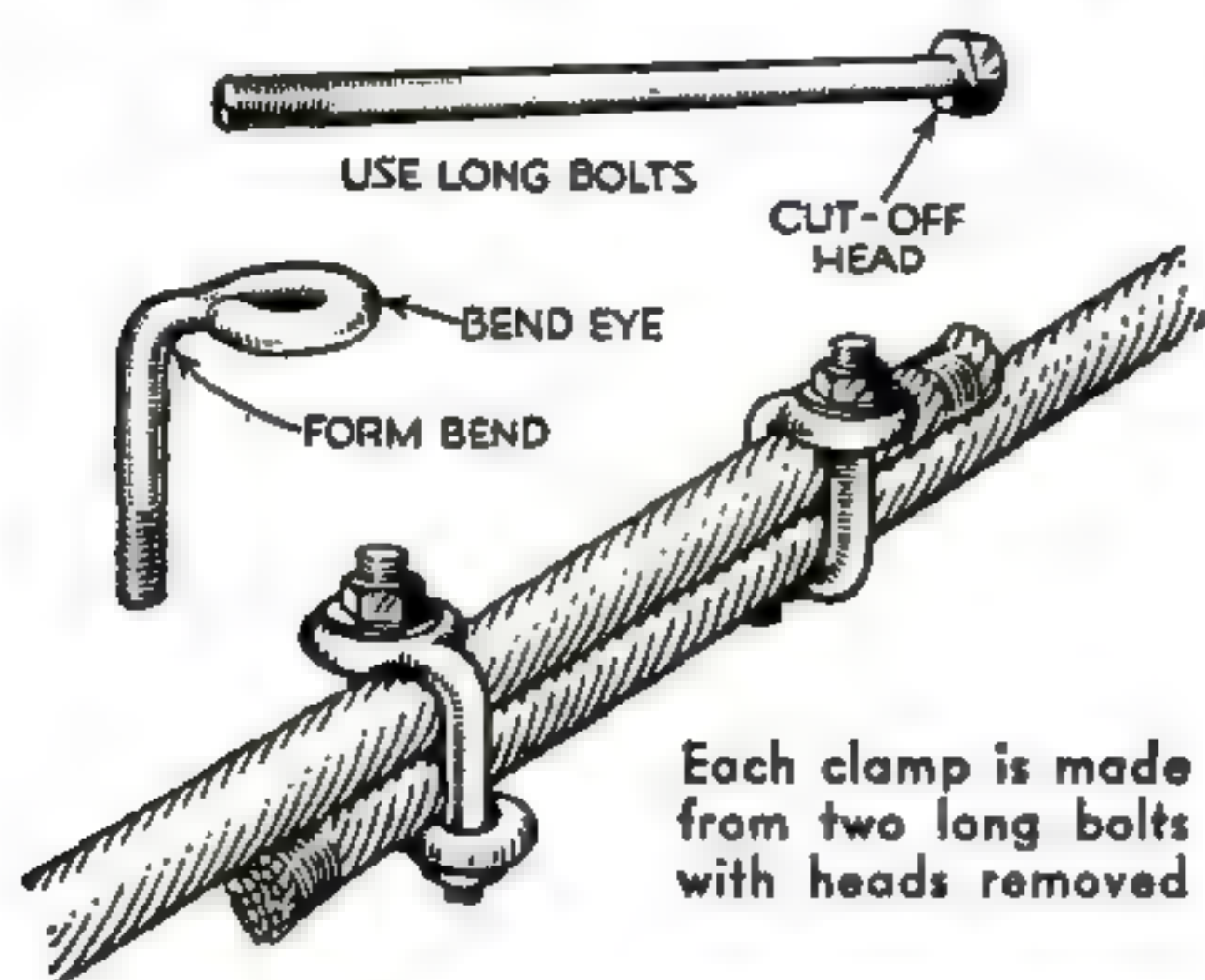
## POPULAR SCIENCE Question Bee

How did you fare in the Question Bee on page 136? Compare your results with the list below, in which the letter alongside each number indicates the correct answer to the corresponding question. Allow yourself five points for each question that you answered correctly. A total score of 75 to 85 is good; 90 or better is excellent.

- |      |      |       |       |       |
|------|------|-------|-------|-------|
| 1. b | 5. b | 9. c  | 13. c | 17. c |
| 2. b | 6. c | 10. b | 14. b | 18. c |
| 3. c | 7. b | 11. b | 15. c | 19. b |
| 4. a | 8. a | 12. a | 16. b | 20. a |



## Clamps for Wire Cables Improvised from Bolts



CLAMPS for joining wire cables may be improvised when necessary from ordinary bolts. The heads are cut off bolts of suitable length, an eye formed in the unthreaded end of each, and a bend made as shown. The bolts are then used in pairs to act as clamps.

## Paper Covering Keeps Workbench Clean

IN A CORNER of my shop, I have an L-shaped workbench, about 6' long one way, 8' the other. The top of the 6' bench, which is made up as a drawer cabinet, is covered with  $\frac{1}{4}$ " plywood, sanded smooth and painted. This is used for designing, assembling, fitting, and testing projects.

To keep the top clean and also provide a place for me to make sketches, detail drawings, and the like, I mounted under the top at the back a roll of wide, tough wrapping paper. The end of the paper is drawn through a  $\frac{1}{4}$ " space between the bench top and the wall, then carried over the bench top itself to the front edge. Here the paper runs through another narrow slot. When the paper becomes soiled or I am through using the sketches on it, it is a simple matter to pull the end until a fresh surface is exposed. What work I do at the bench is often done right on top of a full-size layout sketch I have made for the purpose.

The larger bench is covered with common building paper. Two or three thicknesses are tacked on with thumb tacks, driven in with a hammer. When the top is soiled with oil from motor bearings and the like, I merely rip off the paper and put on a new covering. This takes about fifteen minutes and is required about once a month under ordinary conditions. It keeps the workbench looking neat at all times and the cost is practically nothing.—M. L. FULLER.

## Amazing Quick Relief For Acid Indigestion

**YES—TUMS** a remarkable discovery brings amazing quick relief from indigestion, heartburn, sour stomach, gas, and burning caused by excess acid. For TUMS work on the true basic principle. Act unbelievably fast to neutralize excess acid conditions. Acid pains are relieved almost at once. TUMS are guaranteed to contain no soda. Are not laxative. Contain no harmful drugs. Over 2 billion TUMS already used—proving their amazing benefit. Try TUMS today. Only 10c for 12 TUMS at all drug-gists. Most economical relief. Chew like candy mints. Get a handy 10c roll today.

You never know when  
or where



Tums are anti-acid—not laxative. When you need a laxative get—*Nature's Remedy*. This all vegetable laxative brings such gentle, dependable relief for conditions due to constipation.

## FENCING

Develops strong body and alert mind. **HARMLESS.** The spring-steel 3-foot-long foils (swords) are equipped with rubber buttons. Aluminum cup-shaped hand guards. Our De Luxe foils are built for hard usage. Complete set of two foils (swords) and free instruction booklet, only \$1.98. We pay postage. **ORDER NOW.** All-American Fencers Guild, Dept. 1-SP, 48 W. 48th St., New York

## TRAILER BUILDERS

Send 10c for our latest Deluxe Trailer plans with all the modern improvements known to trailer builders. We supply everything at bargain prices. Our new 1939 trailer supply catalog (largest and most complete) is free.

National Trailer Equipment Co., Dept. P-12, 714 W. Wisconsin Ave., Milwaukee, Wis.

## Earn Cash at Home!



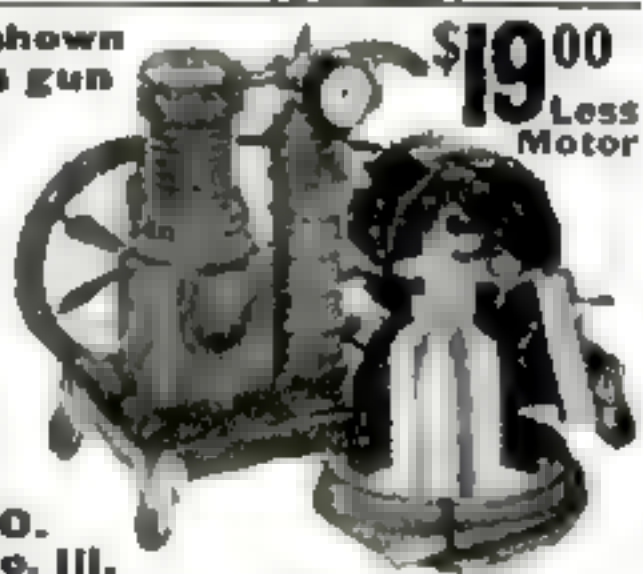
We paid M. M. \$1174 for exceptional "cellar crop" SNOW-KING mushrooms! Big free picture book tells if your cellar, shed, barn suitable. We furnish materials, buy all crops through our 25 branches. Write today for "Guaranteed Success Plan" backed by Company. Established 1908.

UNITED MUSHROOM CO.  
3848 Lincoln Ave., Dept. 340, Chicago.

## SPRAY UNIT \$25.00 as shown 22.50 less gun \$19.00 Less Motor

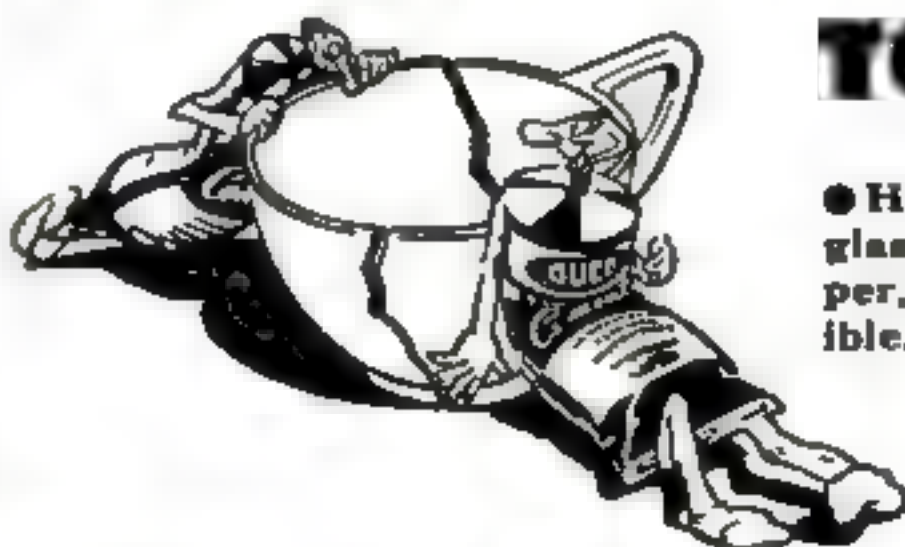
A low priced quality power sprayer that will spray lacquers, enamels, varnishes, dyes, cold water paints to any surface. It is compact, portable, simple to operate, built to stand hard use and economical to use. Complete unit is equipped with 3 cubic foot piston type compressor, latest type pressure feed spray gun with fan and round cape, 15 feet hose, air gauge, 1/2 H.P. 110V. 60 cycle AC motor. Send \$3.00 with order balance express C.O.D. Specify No. 150A. A 5 cent stamp will bring you No. 9 catalog listing this and 600 other items.

BALCO ELEC. MOTOR & SUP. CO.  
C1-605 Washington Bl. Chicago, Ill.



## BRINGS OLD FRIENDS

## TOGETHER



● Holds permanently on china, glass, wood, metal, leather, paper, fabrics. Transparent, flexible, waterproof—not affected by heat. Dries quickly. Ideal for model making as well as for mending.



## DUCO CEMENT



# World's Most Amazing Book of *Rare and Secret* Information!

## The Book of Formulas

The basis of many fortunes! Formulas, recipes, methods and secret processes for making and improving upon beverages, glues, cements, enamels, paints, cosmetics, dyes, inks, tooth pastes, soaps, silver and nickelplating, oils, lubricants, and a thousand and one things for commercial and household use! Your fortune may hang upon one little hint from this most amazing of books! Information from a thousand sources—not normally available to the general public—now published for the enjoyment and practical profit of our readers.

### See What You Can Make

You can easily make mixtures to keep your windshield shining like crystal, whiten discolored teeth, keep silverware bright and clean. You can make beverages, or power belt dressings, perfumes, shampoos, bleaches, photographic solutions, essences and extracts, manufacture battery fillers or solutions, and do a thousand other things—all with the plain and easily followed formulas in this book.

### FUN and PROFIT for Experimenters

If you like experimenting with things, either as a hobby or as a serious vocation, here are modern formulas which, taken as a base, may lead you to unique discoveries and profits.

**\$1.00**

only **C. O. D.**

**Send No Money Now**

Popular Science, Dept. 19

353-4th Ave., New York

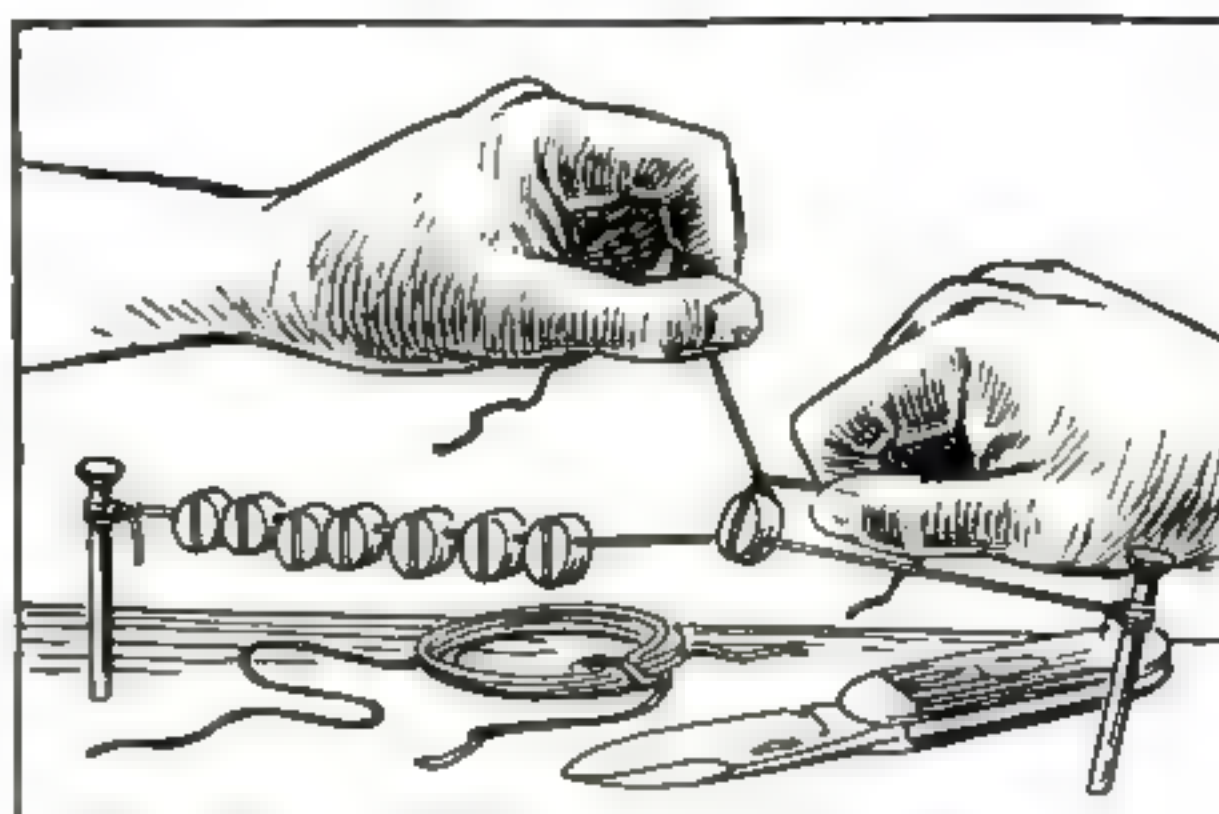
Send me *The Book of Formulas*. I will pay postman \$1.00 C.O.D. plus few cents postage, upon delivery. Money back if not satisfied.

NAME.....

ADDRESS.....

CITY.....STATE.....

## An Easy Way to Apply Straps to Ship-Model Blocks



**B**LOCKS for ship models can be "strapped" with thread or wire more conveniently and quickly, and are also less likely to be lost, if they are strung on a wire stretched between two nails as shown above. This method is equally useful when the blocks have to be painted.—WARREN F. ROBINSON.

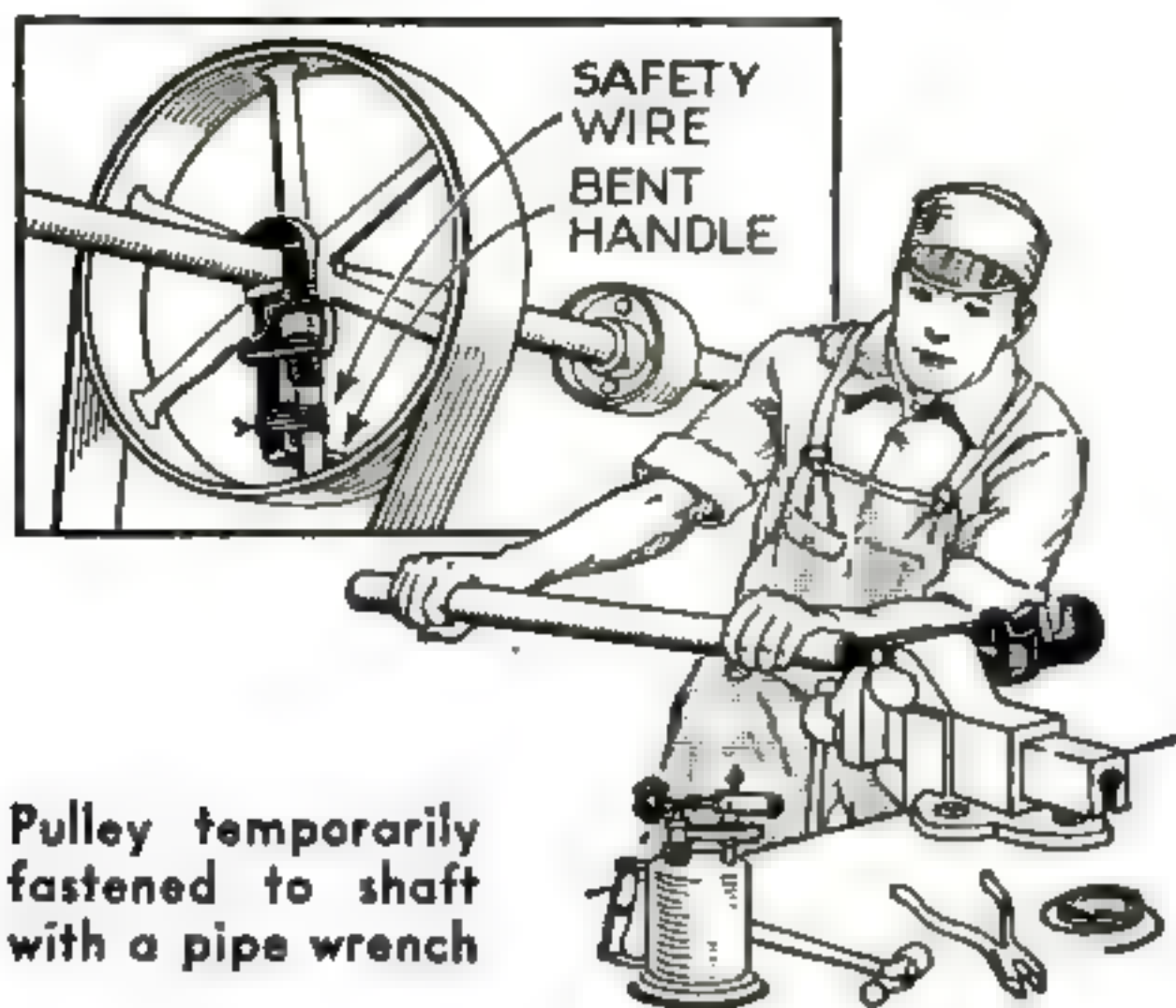
## Old Plywood Packing Cases Serve Many Purposes

**L**ARGE plywood boxes such as are commonly used for shipping electric refrigerators can often be had at a trifling cost from refrigerator dealers. They therefore offer an inexpensive source of plywood panels for many uses around the home. One of these is as wall board where looks are not important. As each panel has its individual framework, it is quite rigid, and only a light studding is necessary upon which to build a dividing partition such as might be desirable in the cellar to hide the heater or to close in a playroom. They will also serve to cover over the rafters in an attic to make it warmer and easier to keep clean. The plywood makes sturdy drawer bottoms and tops for card tables, and backs for chests of drawers, dressers, and other pieces of furniture you are repairing.—ARTHUR L. D. FORD.

## Bone-Glue Mixture Protects Against Welding Spatters

**T**HE bothersome spatter of hot metal and oxides from arc welding can be easily removed if the surfaces around the weld have been painted lightly with a mixture of half linseed oil and half bone glue of high viscosity. The coating, which prevents the small globules of hot metal from burning and sticking, may be wiped or washed off with hot water. This application will not damage most finishes, and is invaluable when welding on or near machined surfaces.—LESTER J. KING.





Pulley temporarily fastened to shaft with a pipe wrench

## Wrench Holds Slipping Line-Shaft Pulley

WHEN a 20" steel pulley on a heavily loaded line shaft began to slip and it was impossible to shut down the plant more than a few minutes at a time to make repairs, we bent the handle of a 16" pipe wrench at right angles about 7" from the end and applied the wrench to the shaft as shown. A wire was wrapped around the handle as a safeguard. The wrench held firmly until it was possible to make permanent repairs several months later.—N. S. MCEWEN.

## Spreading Asphalt on Pipes to be Laid Underground

CHEAP road asphalt will protect black pipe from corrosion in underground work and thus effect a large saving in cost over galvanized pipe, which is considerably higher. Painting the asphalt on with a brush is, however, slow work, and at the end of the job the brush is usually of no further value. Here is a much quicker and better method:

Place under the pipe a piece of discarded inner tube rubber approximately 10" by 15". Raise the rubber up around the pipe and hold it at each end tightly at the top, allowing the middle to sag. Have a helper pour the warm liquid asphalt into the sagged portion of the rubber; then draw the rubber along the pipe. This leaves a deposit of asphalt as thick as will remain on the surface.

An extra heavy deposit is automatically left at each end of the couplings as the rubber stretches over them, and this protects the exposed threads from corrosion. The threaded portion is the thinnest part of the pipe, and this part, it should be noted, is not protected at all by galvanizing in laying galvanized pipe. I have seen asphalt-covered pipe removed after twenty years that was in much better condition than galvanized.—S. R.

## Amazing NEW GLAZE Beautifies and Protects



Car Owners! Meet MASTER GLAZE - the sensationally different luster for new and used cars!

Not a wax - not an oil polish - not a paint - nothing that "smears" over the surface. A creamy liquid - quick and easy to apply! Gives a hard, glass-like surface. Even gasoline cannot dull it! Lasts six months to a year! Amazing luster - beautiful, sparkling clean and brilliant! Doesn't fingermark - doesn't smear! Seals the pores - protects! Nothing like it!

**FREE** Write now for Free booklet and **SAMPLE OFFER**. Free Trial offer. Just send your name and address.

MASTER GLAZE CO., 7728-28 W. HARWOOD AVE., MILWAUKEE, WIS.

## NOW a DYNAMIC HEAVY DUTY INDUSTRIAL WELDER

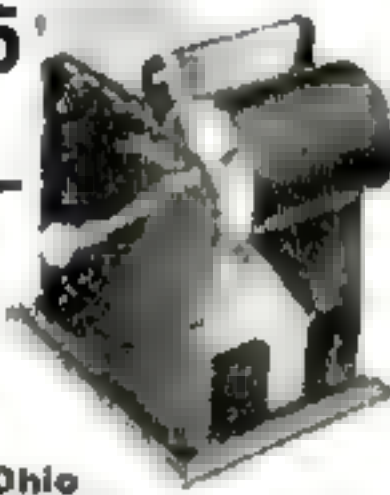
**WORKS OFF 110-Volt Light Socket.** This marvelous **\$195** Dynamic Power Welder does the work of much higher priced types. It is RETAIL, easily portable. **WELDS** Cylinder Blocks, Bumpers, Fenders, Tanks, Farm Machinery, etc. Will also solder and braze on the lightest material. Works on iron, steel, tin, brass, copper and all other metals. Men without previous experience can make as much as \$5.00 on a one hour repair job. Go into business—Open a Welding Shop Now. **AGENTS**—Make big profits selling to garages, factories, janitors and machine shops. **WRITE** for 10-Day Trial Offer. **DYNAMIC WELDER COMPANY** 2226-6A SILVERTON ROAD, CHICAGO, ILLINOIS



## POST CARD, ROTARY \$9.95 DUPLICATOR only

PRINT-O-PRESS Post Card Duplicator duplicates post cards by thousands—or any card 3 1/2 x 5 1/2, from stencil with true rotary principle assuring fast duplication with accurate and perfect register. Comes complete at this amazing low price of \$9.95 including supplies. User-Agents write. Details FREE, also samples of work.

Professional Products Corp., Dept. 156, Silvertown, Ohio



## AMAZING MACHINE GROWS HAIR

"Intermittent Vacuum" stimulates deep-lying scalp blood vessels—and GROWS HAIR in thousands of cases of baldness. Stops falling hair. Tones up scalp. New hair often in 30 days. Easy to use this amazing machine at home. Only \$9.95 complete. Write quick for FREE TRIAL OFFER. **Only \$9.95 COMPLETE**

FULLY GUARANTEED

RAND, DEPT. 8-1639, NEWPORT, KY.

## CUT ME OUT

Cut me out, paste me on a postcard and mail to Popular Science Monthly, Dept. 19, 353 Fourth Ave., New York, N. Y. I'll bring you complete supplies and instructions on how to make easily several dollars a week in your spare time.

## WANTED 500 Men at Once!

ANNOUNCING a new invention called Magic A Brush. Cleans clothes at home. SAVES DRY-CLEANING. Erases dirt like magic. Never anything like it. Works wonders on Auto Cushions. Cleans Hats, Drapes, Window Shades, Upholstered Furniture, like a flash. Instantly grips attention wherever shown.

The inventor wants 500 men and women at once to help him introduce his lightning seller. Anyone who gets the Agency is headed for a big steady income. He offers to send samples ON TRIAL to all who write him. A penny postal will do. No obligation. Get details. Be first—send in your name to **INVENTOR KRISTEE, 611 BAR ST., AKRON, O.**

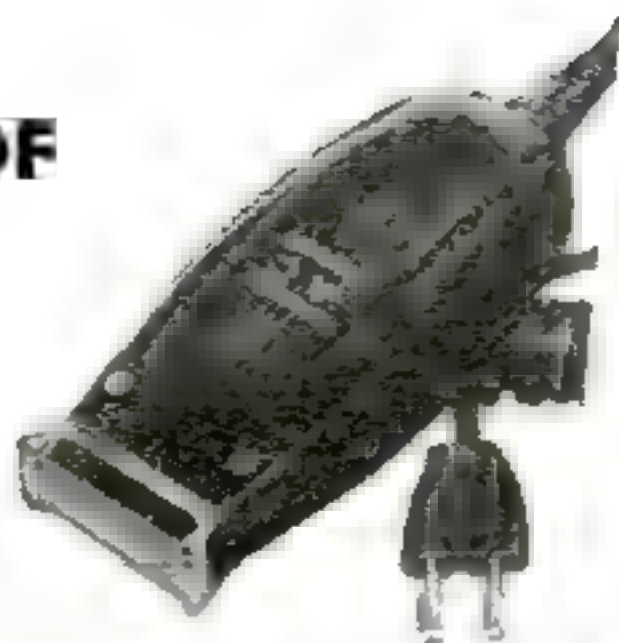


# \$5

**GIVES YOU  
TROUBLE-PROOF  
SHAVING!**

## The HANLEY AC

A Marvel of Mechanical Simplicity for  
AC Current—No Radio Interference



At last trouble-proof electric shaving! A shaver simply—yet scientifically—constructed. Only 2 moving parts. Has twice the power to cut wiriest beard. Proven exclusive shearing mechanism shaves barber-close. Guaranteed satisfaction.

Operates on DC with special current converter \$1.50.

Order from your dealer or direct—\$5 (Money Order or check). Or order C. O. D., enclosing \$1 with order and pay postman \$4 on delivery.

**CLIPSHAVE, INC., Port Chester, N. Y.**

# YOU CAN!

## CONTROL YOUR FATE

Only one power controls your destiny—a strange force sleeping in your mind. Awaken it! Command it to obey you! Push obstacles aside and attain your fondest hopes and ideals. The Rosicrucians know how.

**WRITE FOR FREE BOOKLET**

Learn why great masters through the ages were Rosicrucians. Free booklet tells the fascinating story of this age old Fraternity and how to obtain its priceless teachings. Write to: Scribe Y.T.G.,

**THE ROSICRUCIANS (AMORC)**  
SAN JOSE, CALIFORNIA



## FIX IT YOURSELF

Save yourself a lot of expense by doing your own odd repair jobs. Get this new edition of a famous book, showing with diagrams and directions, how to fix and repair furniture, electric outlets, windows, doors, leaky pipes, floor boards,

chimneys, boilers, weather proofing, painting and hundreds of other construction and repair jobs. Picture diagrams show how each job is done. Full cloth bound \$1.00.

**Popular Science Monthly, Dept. 19**

**353 Fourth Ave.**

**New York, N. Y.**

# Saw-Filing

**Pays up to \$2 to \$3 an Hour in Spare Time — No experience needed**

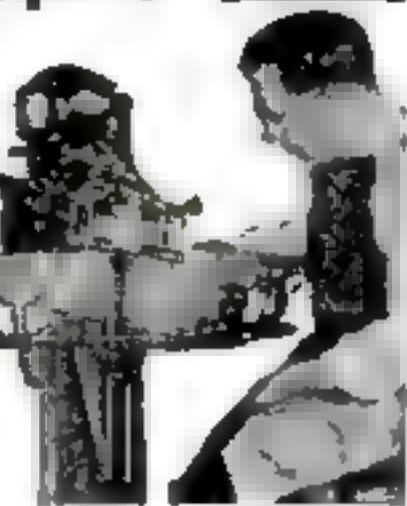
A FOLEY Automatic Saw Filer files hand, circular and band saws better than the best hand filer. Cash business, no canvassing, no eye-strain. Louis P. Wadsworth, Ohio, says, "I have filed 764 saws in spare time and have earned \$850.00 in carpenter work due directly to my saw filing contracts." Send coupon for FREE PLAN, no obligation.

**FOLEY MFG. CO.,** 119-9 Foley Bldg., Minneapolis, Minn.

Send Free Plan on Saw Filing business.

Name.....

Address.....



## Working from Plans Drawn on a Different Scale

IN MODEL making, especially in connection with model railways, it is often necessary to use plans drawn on a different scale from the one desired. There are, of course, various ways to overcome this difficulty. If proportional dividers are available, they may be used, or a cardboard scale or graph may be prepared with drafting instruments. When arithmetic alone is to be relied on, all that is necessary is to find the conversion factor. This is simply the figure by which the dimensions on the drawing have to be multiplied to convert them to the required scale.

The conversion factor is the required scale divided by the given scale. Suppose, for example, you are building a ship model from plans that are drawn on a scale of  $\frac{1}{8}$ " equals 1', but the scale you wish is  $\frac{5}{16}$ " equals 1'. Divide  $\frac{5}{16}$  by  $\frac{1}{8}$  and you get a conversion factor of  $2\frac{1}{2}$ . This means that all dimensions as given on the plan are to be multiplied by  $2\frac{1}{2}$  in order to build to the  $\frac{5}{16}$ " scale.

To convert from a scale in millimeters to one in inches is almost as easy. Suppose you are building an HO-gauge car on a scale of 3.5 mm. equals 1', but the plans give dimensions on the scale of  $\frac{1}{4}$ " equals 1'. First change 3.5 mm. to inches by multiplying by 0.03937, since 1 mm. equals 0.03937". This gives you 0.138". Now divide 0.138 by  $\frac{1}{4}$  (0.25) and you find the conversion factor is 0.552. If all dimensions given for the  $\frac{1}{4}$ " scale are multiplied by this, you will have the correct dimensions for the 3.5-mm. scale in terms of decimals of an inch.—C.V.

## How to Cut Thin Washers with a Hack Saw

WHEN very thin washers are required and a lathe is not available, they can be cut by placing two blades in a hack-saw frame, separated with a spacer of the proper thickness. The spacer can be held in place with a piece of friction tape or a small clamp.

## Small, Delicate Models Sanded with Finger-Nail Strips

NARROW, flexible abrasive strips or emery boards, which are sold at trifling cost by the package for manicure use, are very effective for sanding small, delicate models and many types of irregularly shaped parts. Model makers should always keep a supply on hand.—RICHARD PATRICK.



**This One**



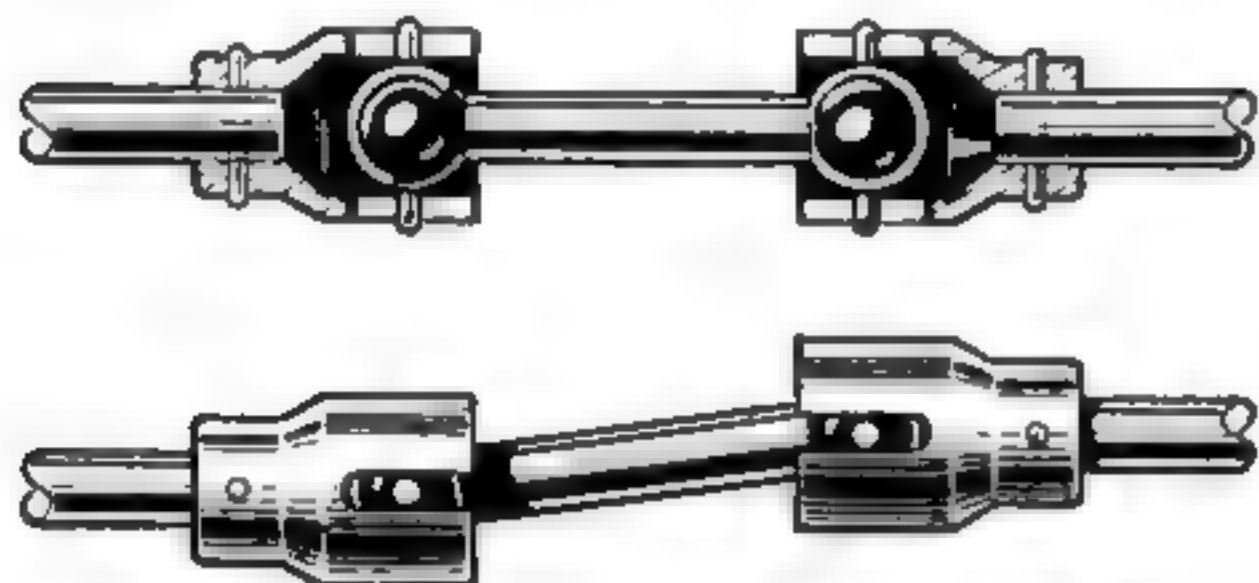
**JPPH-LPG-8YY7**



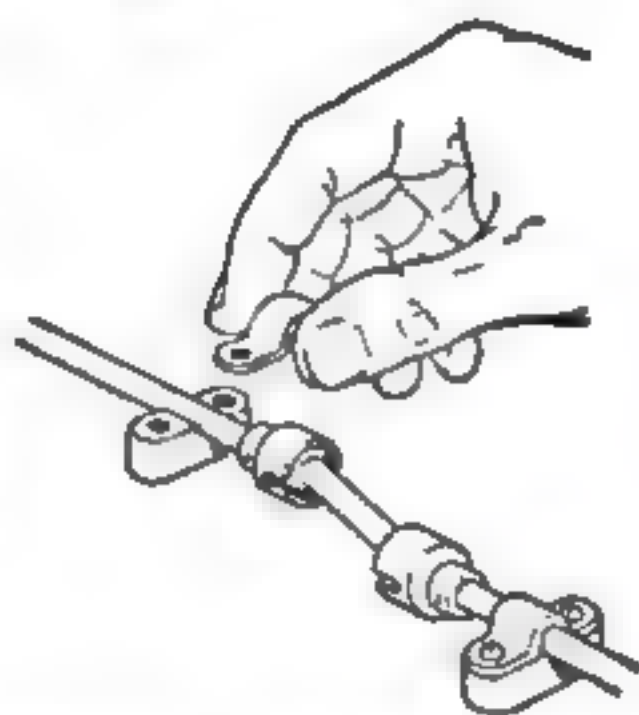
# Universal Coupling for Small Models

MODEL makers or experimental mechanics sometimes require a really small universal coupling. The one illustrated was designed for use in a model locomotive, where the requirements were ease of construction, dependability, and quiet operation at either high or low speeds. The unit has a maximum diameter of only 5/16", and connects two 1/8" shafts, which are about 1 1/4" apart. Despite its small size, the coupling has given excellent service over long periods.

The coupling consists of two slotted sockets, one on each shaft, and a short intermediate shaft with a ball and pin at each



Sectional drawing of the miniature universal coupling, a view of the outside, and a sketch showing how it is used on shafts that are out of line



end. It is best to make the sockets first. Mount a short length of steel rod in the lathe and, using a drill in the tailstock chuck, drill to the shaft diameter. Open out the drilled hole to about twice its diameter for the depth shown, and then cut off. When two of these are finished, carefully saw or file the slot to fit the pins.

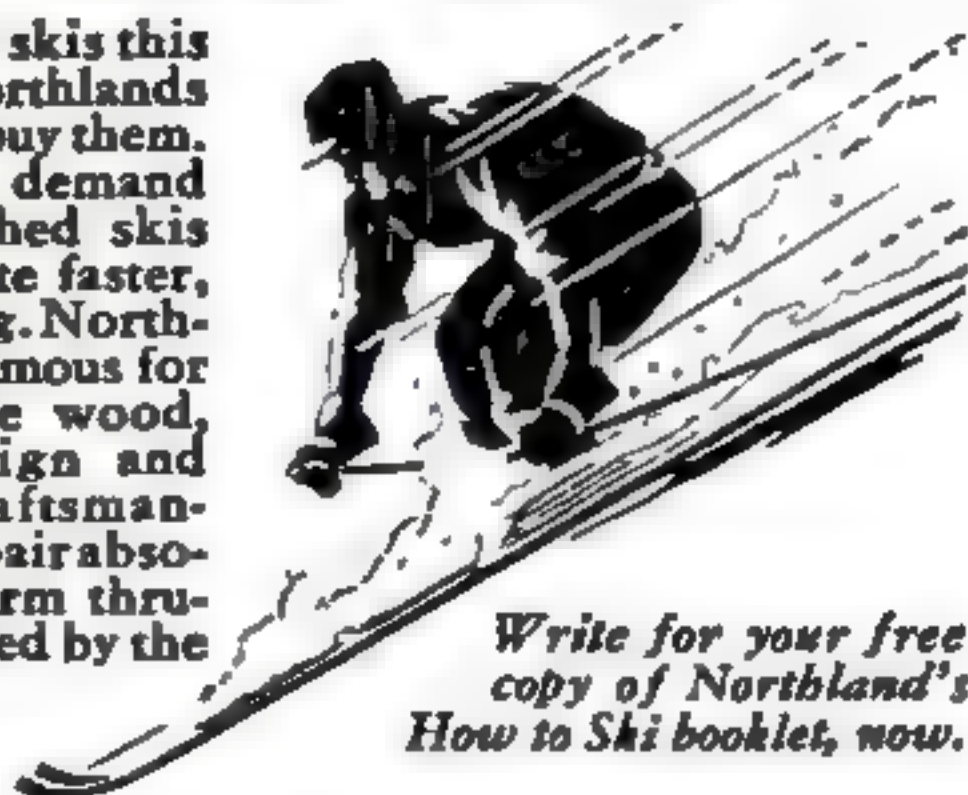
Turn the entire length of the intermediate shaft until it is a close fit in the sockets; then reduce the center portion to about one half the diameter, and finish the ball ends with a hand turning tool or a fine file. Complete the shaft by drilling the ends and forcing in the pins.

The coupling may be made from any available material, but steel sockets and an intermediate shaft of bronze will give the strongest and slowest wearing combination. Brass may, however, be used with satisfactory results. In any case the pins should be of steel.

A bit of cotton pushed into each socket before the shaft is inserted will help retain the lubricant.—L. F. BEACH.

# NEED NEW SKIS....?

IF you need skis this year, see Northlands before you buy them. Champions demand these matched skis that promote faster, easier skiing. Northlands are famous for their choice wood, expert design and master craftsmanship. Each pair absolutely uniform throughout. Identified by the famous Deerhead.



Write for your free copy of Northland's How to Ski booklet, now.

## NORTHLAND SKI MFG. COMPANY

World's Largest Ski Manufacturers  
24 Merriam Park St. Paul, Minnesota

## WORLD'S GREATEST all around ELECTRIC TOOL

DRILLS—GRINDS—SANDS—SAWS  
POLISHES—SHARPENS—CARVES

The new WHIZ ELECTRIC TOOL is the handiest power tool ever made. Not a delicate instrument but a real rugged tool, equally effective for both power and precision work. Drills through 1/2 inch iron plate in 42 seconds or engraves intricate designs on jewelry. Handles any material: Metals—Woods—Alloys—Plastics—Glass—Steel—etc. Saves time. Eliminates labor. Plug into any socket AC or DC, 110 volts. Chuck 1/4 inch capacity. Ball bearing thrust. Powerful, triple-gear motor. "Worth its weight in Gold." STANDARD MODEL with Normal Speed (uses 50 different accessories, instantly interchangeable). Special Introductory Price for limited time, only \$6.95.

FREE Accessory outfit (Value \$2) includes set of drills, mounted 1 1/4 inch grinder, sanding discs, cutting wheels, mounted brush, polishing wheel, carving bur, etc. FREE with each outfit ordered NOW. We pay postage. Will send C. O. D. if desired. 10-DAY TRIAL—MONEY BACK GUARANTEE.

Special "2-SPEED" MODEL combines Normal Speed and High Speed in one outfit (uses 200 accessories) only \$8.95 complete, with same accessory outfit (value \$2) FREE.

Paramount Products Co., Dept. 1C, 48 West 48th St., New York



## IF I Send YOU THIS FINE SUIT—

Will You Wear It and Show It to Friends?

I need a reliable man in your town to wear a fine, made-to-measure, all-wool DEMONSTRATING SUIT—advertise my famous Union clothing—and take orders. You can make up to \$12.00 in a day. My line contains over 150 quality wools, all seasonal values, guaranteed. You need no experience or money. I supply everything required, FREE of extra cost. Write me today for FREE details. N. J. GRAVES, STONEFIELD CORP., 1300 W. Harrison Street, Dept. N-821, Chicago, Illinois.

## CUT ME OUT

Cut me out, paste me on a postcard and mail to Popular Science Monthly, Dept. 19, 353 Fourth Ave., New York, N. Y. I'll bring you complete supplies and instructions on how to make easily several dollars a week in your spare time.

## Sani-Flush

SAFE, NOT  
CAUSTIC

KEEPS AUTOMOBILE RADIATORS CLEAN

## BIG SPARE MONEY AHEAD

Take Orders for the new Popular Science Friends Buy it on Sight!  
Learn How Easy It Is To Make Real Money in Spare Time!

MAIL COUPON TODAY  
POPULAR SCIENCE MONTHLY Dept. 19  
353 Fourth Ave., New York, N. Y.

Please send me full information free on how I can make big money in my spare time.

(NAME)

(ADDRESS)



# FOR YOUR OWN WORKSHOP

These practical, easy-to-understand, fascinating handbooks will help you to get the most out of your hobby. Written by experts especially for Popular Science Monthly readers, they are invaluable to the mechanically minded man. You need not hesitate to order them for yourself or for gifts. *We guarantee complete satisfaction or money back.*

**THE MOST PRACTICAL, EASY-TO-FOLLOW MANUALS EVER PUBLISHED**

## MAKING MONEY WITH YOUR CAMERA

Here is an exceptionally practical manual which will teach you many kinks and tricks, ways and means to take and sell pictures. It clearly demonstrates by pictures and directions the principles of picture taking that bring you photos which are marketable—and how and where to sell them. **COMPLETE, FASCINATING, EASY TO UNDERSTAND.** The ingenious amateur who can learn how to apply some of the simple rules in this book can make enough money with his camera to pay for all his photographic activities, and lay aside some welcome profit as well. 256 pages, full cloth bound, \$2.00.

## Wood Carving and Whittling—

**An Artistic and Interesting Hobby for All**



Working in wood is the most fascinating and enjoyable of all hobbies. This new practical handbook starts with the simplest kinds of wood carving and shows you step-by-step, how to become expert. How to carve figures of men, animals, birds, with simple hand-tools. Chip carving, incising, level surface carving, relief carving, explained with simple step-by-step instructions and diagrams. How to carve furniture, ornaments, frames, jewelry boxes, trays, treasure chests, etc. Fully illustrated, 265 pages, full cloth bound, \$2.00.

## All You Need to Know About Electroplating Now in One Practical Handbook

Written especially for the amateur, this book tells you



how to utilize many odds and ends to build a complete home electro-plating workshop. Instructions, pictures, and diagrams show how easily you can do copper, nickel, chromium, silver and gold plating. How you can plate household or automobile fixtures, hardware, tools, silverware, ornaments, clocks, watches, bracelets, rings, metal parts of all kinds. How to plate with contrasting metals—obtain unusual finishes with chemical coloring. Scores of illustrations, diagrams, and pictures. 260 pages, full cloth bound, \$2.00.

## RADIO BEGINNERS SIMPLIFIED MANUAL

Every radio operation from simple soldering to trouble shooting, to building and improving marvelous long and short wave sets, is made so simple and clear that you just cannot fail to understand many things that may have puzzled you before. A few minutes a day with this manual will teach you what it takes years to learn without it. Prepared by technical radio experts who KNOW how to explain things for non-technical radio enthusiasts. **POPULAR SCIENCE MONTHLY** publishes this book. Do not hesitate to send for it because **WE GUARANTEE** that if you are not satisfied we will send your money back to you. Cloth bound, 256 pages, hundreds of simplified drawings and diagrams. \$2.00.

## DECORATIVE METAL WORK Simplified for Beginners

A brand new manual that tells in easy-to-understand language how to make useful metal articles in your home workshop with simple tools. How to do inlaying, spinning, cutting, etching, joining, plating and finishing. How to make jewelry, novelties, candle sticks, ash trays, lamps, hardware, and other useful metal articles. Full cloth bound, fully illustrated, \$2.00.



## MODEL RAILWAYS

**The Latest Manual on the Subject!**

A practical handbook that shows how to lay out and operate a home-made model railroad. Easy-to-follow instructions for building a box car, gondola, refrigerator, tank, hopper, day-coach, pullman, baggage, observation car, and Atlantic type locomotive. How to turn out fireboxes, boilers, and wheels in your own shop. How to make an illuminated dispatcher's track diagram. How to build and install a block signal system, remote train control, automatic couplers, relays, etc. 256 pages, fully illustrated, full cloth bound, \$2.00.





# OR FOR CHRISTMAS GIFTS

## Now it's easy to build your own HUNTING AND FISHING LODGES, CABINS, BUNGALOWS

A big book of definite instructions made for beginners. If you can handle a hammer and saw, there's no reason why you can't build a bang-up cabin in the woods or a bungalow on the lake or shore, or a roadside stand, and make one you or anyone would be glad to look at, live in, or own.

Here are complete plans, and step-by-step instructions for every stage of the work. Designs for numerous log cabins, lodges, tourist homes, way-side stands, bungalows.

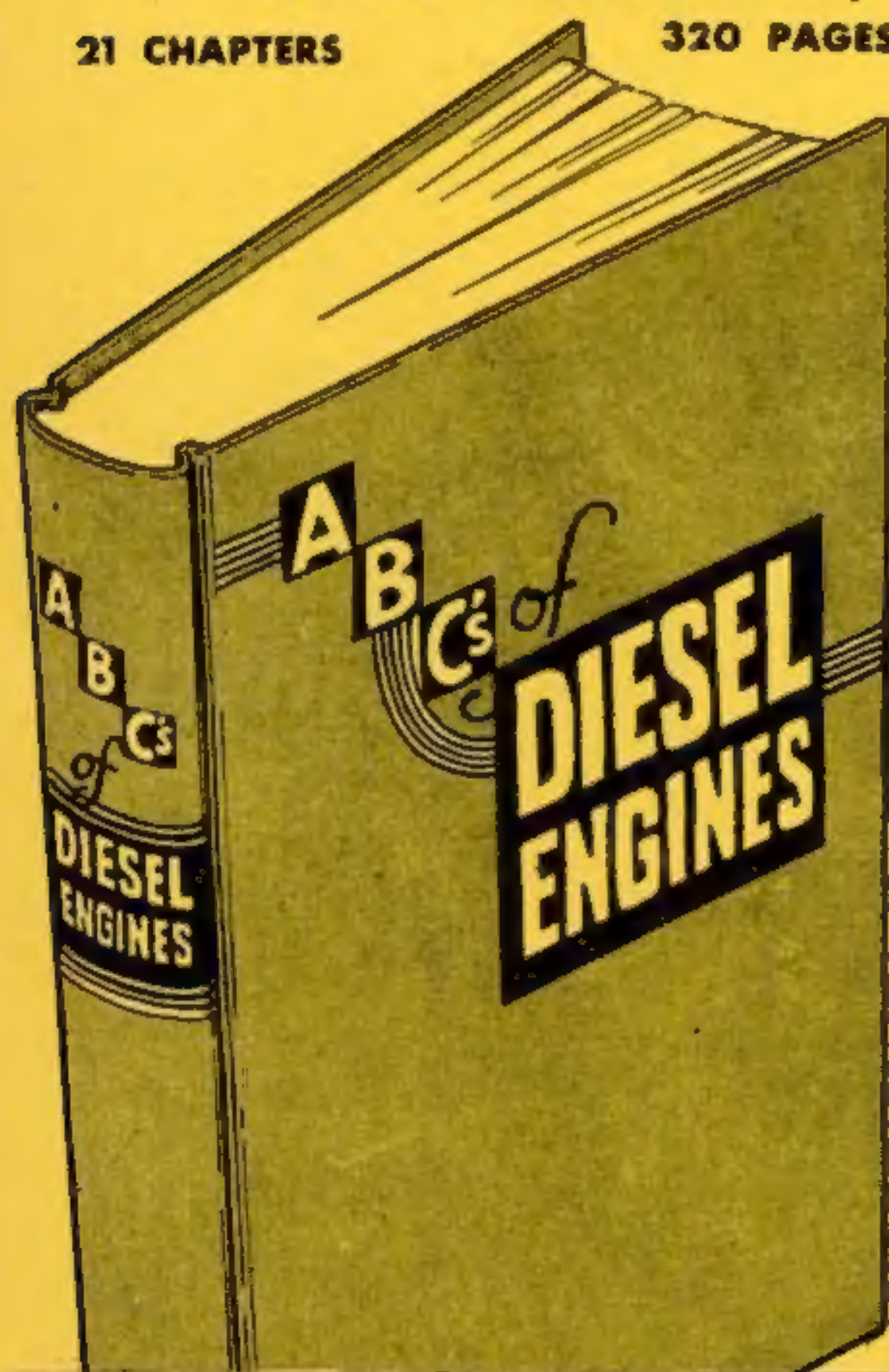
Not just a book of pictures but a full course of instruction. You will make no mistakes because every step is explained and shown in picture diagrams. Every problem of location, drainage, water supply, etc. is clearly explained. Tells how to cut and erect your structure—all about floors, roofs, windows, doors,—how to do the whole job from foundation to chimney top. What to do inside and outside. Don't imagine it's hard—when you see the book you'll be aching to grab some tools and get to work. 256 pages, full cloth bound, \$2.00.



## LEARN DIESEL ENGINEERING WITH THIS NEW, SIMPLIFIED MANUAL

21 CHAPTERS

320 PAGES



Here at last is a brand-new book written for the man who has had no previous knowledge of Diesel Engines. Takes you in easy-to-grasp stages right from the fundamental principles of the Diesel to the most modern advanced types of engines. Tells you in clear, non-technical language just how and why the Diesel operates—what happens in the cylinders. All about pressure, volume, speed, and heat. Various fuels and how they are rated. Different types of Diesels, and their comparative economics—air and other types of starters, etc. Adapting the Diesel to automobiles, ships, trains, and air-planes. How you can take advantage of the many opportunities that Diesel Engineering offers.

### Here Are Some Of The Important Chapter Headings

History of the Diesel • The Diesel Cylinder • Diesel Variations • Fuel Injection • Combustion Chambers • Hot-Bulb Oil Engines • High-Speed Diesels • Fuel and Lubricant • Starting and Reversing • Vibration • Diesel Relatives • Accessories and Cooling • Diesels on the Road • Diesel Work-Horses • Diesels on Rails • Diesels on Water • Diesels in the Air • Engine Designs • Diesels of the Future

The A B C'S OF DIESEL ENGINES is profusely illustrated from beginning to end, including useful tables, reference data, operating costs, and other information invaluable to the Diesel-minded man. You can depend upon the completeness and accuracy of this great book. Prepared by the editors of Popular Science Monthly from the very latest material, it's guaranteed to be up-to-the-minute in every respect. Full cloth bound.

Tear off and mail the coupon below TODAY, and we will send any of these books C. O. D., plus a few cents postage.

**SEND NO  
MONEY  
NOW!**

**POPULAR SCIENCE, DEPT. 19B, 353 FOURTH AVE., NEW YORK, N. Y.**

Please send me the book or books I have circled below. I will pay the postman the price shown plus a few cents postage in full payment when the books are delivered. (Money back if not satisfied).

Camera - \$2.00    Electroplating - \$2.00    Metal Work - \$2.00    Cabins \$2.00  
Woodcarving \$2.00    Radio Experimenter \$2.00    Model Railways \$2.00    Diesels \$3.00

NAME.....

ADDRESS.....

CITY.....STATE.....

If you remit now we pay postage. Orders from outside U. S. A. cannot be sent C.O.D.

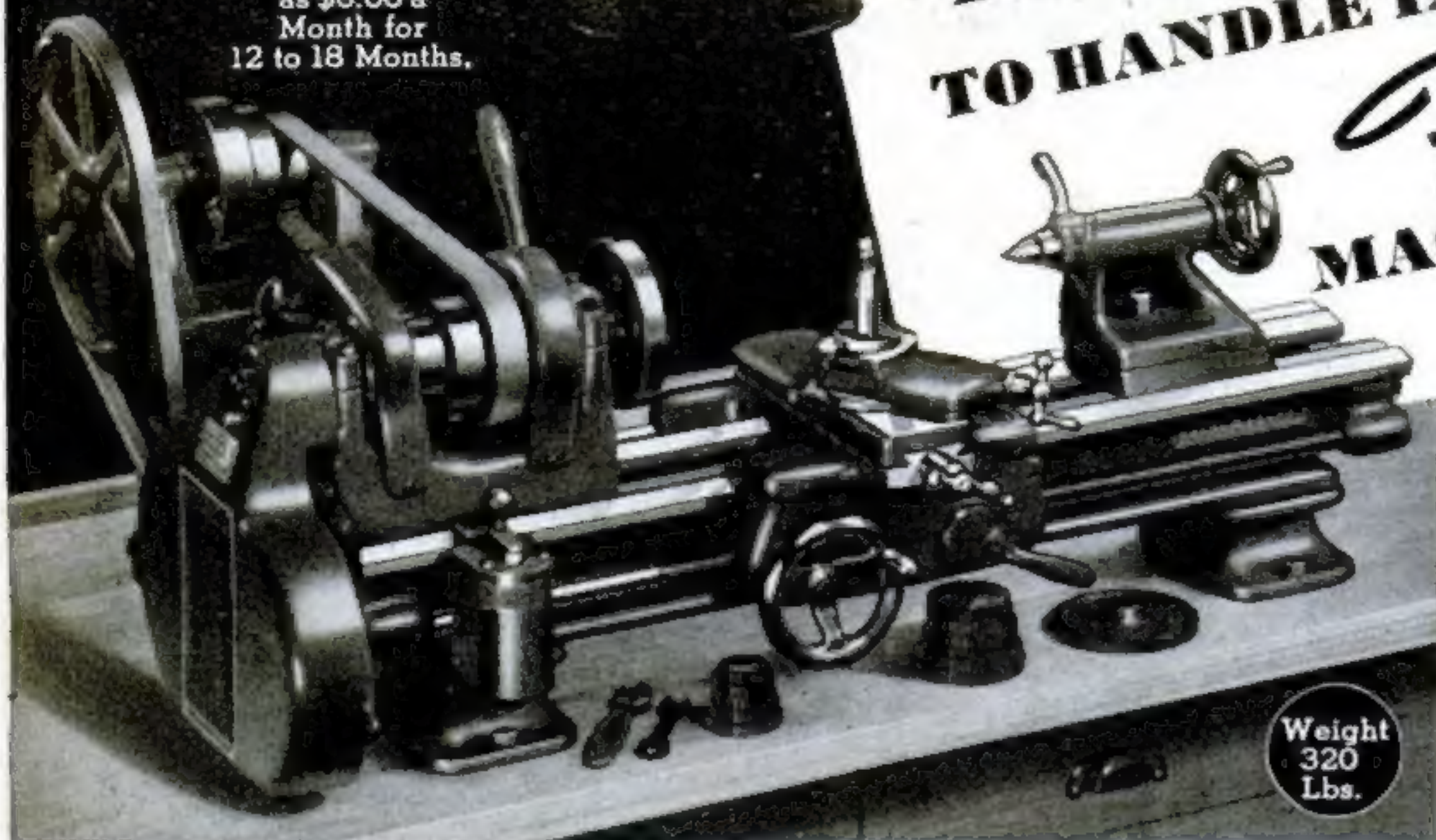


**\$85<sup>00</sup>**

Less Motor Drive

Sold on Easy  
Payments as Low  
as \$6.00 a  
Month for  
12 to 18 Months.

DESIGNED AND BUILT  
TO HANDLE INDUSTRY'S  
*Finest*  
MACHINING JOBS



Weight  
320  
Lbs.

No. 415-YA, 9 $\frac{1}{4}$ " swing by 3' bed Workshop Bench Lathe with  
Horizontal Motor Drive,  $\frac{1}{4}$  h.p. Reversing Motor, Switch, Belts  
and Adjustable Belt Tension Countershaft (F.O.B. South Bend)

**\$117.00**

(\$15 Down—\$7 Monthly for 18 Months)

**B**ACK of the 9" x 3' Precision Lathe is a record of 32 years of fine lathe building—a record which industry the world over recognizes, through continuing purchases of South Bend equipment. It is not enough for the 9" x 3' Lathe to be just a good lathe. South Bend's standard of mechanical excellence requires continual improvement—refinement. This lathe is the finest value that we have ever offered.

Features—Twin Gear Reverse to lead screw, Ball Thrust Bearing on Spindle, Automatic Longitudinal Screw Feed, Precision Lead Screw for screw threads 4 to 112 per inch,  $\frac{3}{4}$ " spindle hole taking collets up to  $\frac{1}{2}$ ", Precision Cut Steel Gears. 38 Attachments are available for milling, grinding, draw-in collet chuck work and many other jobs.

**SOUTH BEND LATHE WORKS**  
830 E. Madison St., South Bend, Ind., U.S.A.

### Send Coupon FOR THESE BOOKS

Latest and most authoritative instruction on lathe practice and operation. Valuable shop information. New edition "How to Run a Lathe"—with 128 pages and 350 illustrations. Over 1,500,000 copies of this book in use. Catalog No. 46-A illustrates, describes and prices 9-inch lathes in 3', 3 $\frac{1}{2}$ ', 4' and 4 $\frac{1}{2}$ ' bed lengths and 8 drives.

### LATHES ARE STOCKED IN PRINCIPAL CITIES

Boston, Massachusetts—The MacKenzie Machinery Company, Inc., 36 Oliver Street  
Bridgeport, Conn.—A. C. Bisgood Machinery & Equipment Co., 17-21 Union Square  
Chicago, Ill.—C. B. Burns Machinery Company, 541 West Washington Boulevard  
Cleveland, Ohio—The Reynolds Machinery Company, Inc., 2034 East 22nd Street  
Dallas, Texas—The Machinery Sales and Supply Company, Inc., 2124 Main Street  
Denver, Colorado—The M. L. Fox Machinery Company, Inc., 1901 Arapahoe Street  
Detroit, Michigan—The Lee Machinery Company, Inc., 6318 East Jefferson Avenue  
Houston, Texas—The Wessendorf, Helms & Company, Inc., 317 Preston Avenue  
Los Angeles, Cal.—Eccles & Davies Machinery Company, Inc., 1910 Santa Fe Avenue  
Milwaukee, Wisconsin—W. A. Voell Machinery Company, 1533 North 16th Street  
New York, New York—The A. C. Colby Machinery Company, Inc., 183 Centre Street  
Philadelphia, Penn.—W. B. Rapp Machinery Company, Inc., 132 North Third Street  
Portland, Oregon—The Portland Machinery Company, Inc., 208 So. West First Avenue  
Providence, Rhode Island—George T. Reynolds & Son Co., Inc., 171 Pine Street  
Rochester, New York—The Ogden R. Adams Machinery Company, 266 State Street  
St. Louis, Mo.—Colcord-Wright Machinery & Supply Co., 1223-1229 No. Broadway  
San Francisco, California—The Moore Machinery Company, Inc., 550 Fifth Street  
Seattle, Washington—The Star Machinery Company, Inc., 1741 First Avenue, South  
Syracuse, New York—H. A. Smith Machinery Co., Erie Blvd. E. and So. Townsend St.  
Tulsa, Oklahoma—The Machine Tool & Supply Company, 215-219 East First Street

**SOUTH BEND**  
Back-Gear  
Screw Cutting  
PRECISION LATHE

This 9-inch  
South Bend  
Lathe Used by:

- MANUFACTURERS
- TOOL ROOMS
- LABORATORIES
- MACHINE SHOPS

—Automotive  
—Electrical  
—Gun Smiths

- U. S. GOVERNMENT
- SCHOOLS
- HOME WORK SHOPS
- INVENTORS

The 9" x 3' South Bend Precision Lathe does these operations:

—TURNS—BORES  
—CUTS SCREW  
—THREADS—FACES—  
DOES MILLING,  
CHUCKING, REAM-  
ING, DRILLING,  
FILING AND HUN-  
DREDS OF OPERA-  
TIONS IN STEEL,  
IRON AND OTHER  
METALS.

There are 5 sizes of South Bend Lathes—9", 11", 13", 15" and 16" swing with bed lengths 3' to 12'. In motor or countershaft drives. Priced \$85 to \$1500.



**SOUTH BEND LATHE WORKS,**  
830 E. Madison St., South Bend, Ind., U.S.A.  
☐ No. 34LB "How to Run a Lathe," 25c  
☐ No. 46-A, 9" Workshop Catalog, Free  
☐ Easy Payment Plan

Class of Work.....  
Name.....  
Address.....  
City..... State.....

**SOUTH BEND Precision LATHES**

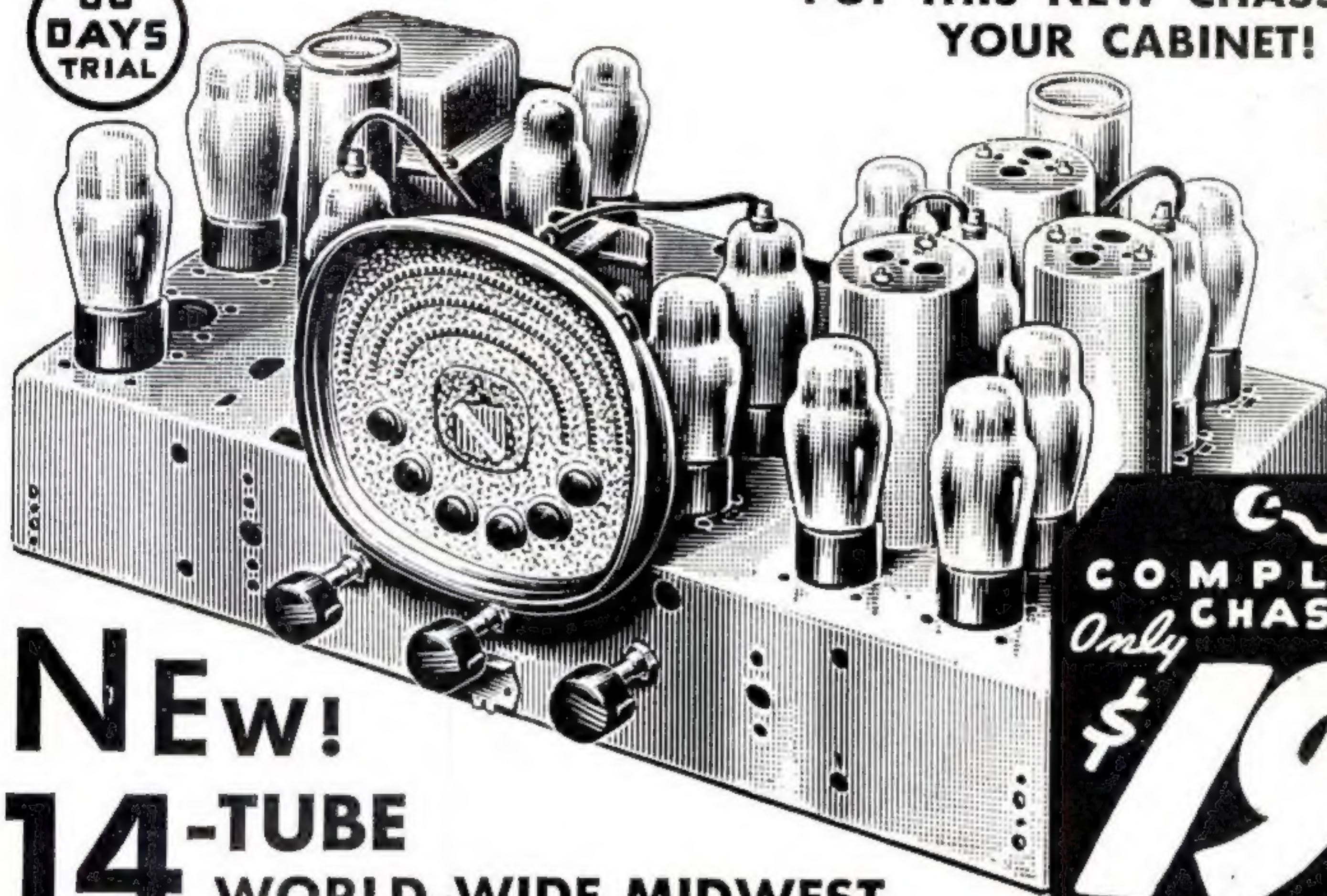


# SENSATIONAL MIDWEST FACTORY-TO-YOU SALE

**30  
DAYS  
TRIAL**

**PUT THIS NEW CHASSIS IN  
YOUR CABINET!**

**Save  
Up To  
50%**

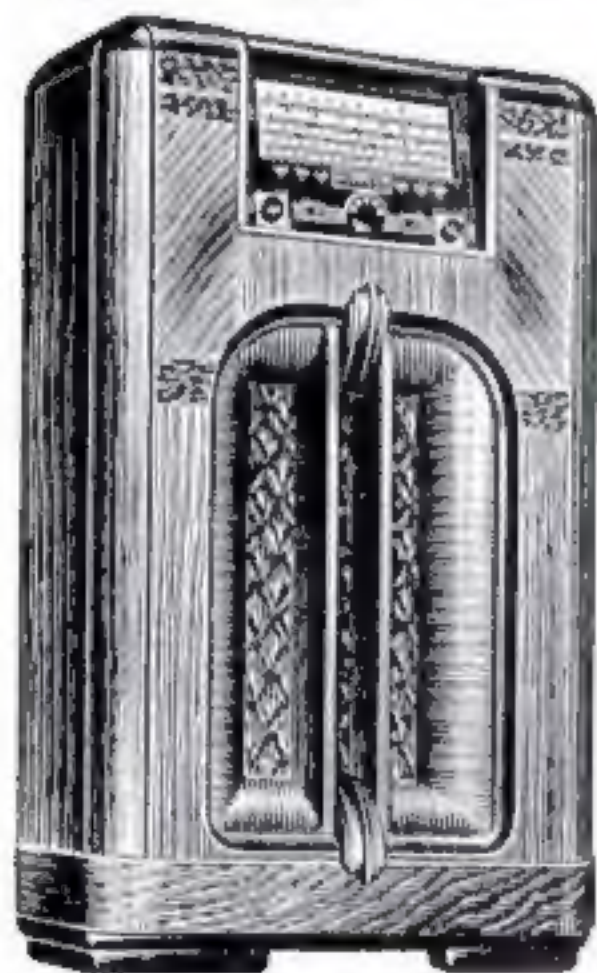


**NEW!  
14-TUBE  
WORLD-WIDE MIDWEST**

**COMPLETE  
CHASSIS**

*Only*  
**\$19<sup>95</sup>**

**WITH TUBES  
AND SPEAKER**



**H**ERE it is, the greatest radio value we have ever offered! A big, powerful, 14-tube, world-wide Midwest. At its sensational factory-to-you price of \$19.95, this new 1939 radio is the biggest bargain in Midwest's nineteen years of pioneering! Why be content with an 8 or 10-tube set . . . when it is so easy to install this new, powerful 14-tube chassis (in your own cabinet) for the same price! For a little more than the cost of new tubes, you can modernize your old radio and get exciting world-wide reception.

**6-Tube Table Models . . . To 17-Tube 5-Band Radios** Midwest makes a radio to suit every purse . . . and prices are as low as \$10.95. Send for the new 1939 Midwest catalog and feast your eyes on a complete line of magnificent rare-wood console and table models using 6, 8, 12 and 17-tubes.



TEXAS—"Midwest's wonderful tone, splendid foreign reception and marvelous selectivity are second to no other radio on the market today."—C. Huddleston.

**LIBERAL TRADE-IN ALLOWANCE  
Up to \$40.00 For Your Old Radio**

. . . on the beautiful 17-tube 5-band model "D" shown at left. Tell us the make and age of your present radio—so we can determine how much to allow you on it. New Easy-Pay Plan makes it easier than ever before to own a Midwest. Absolute satisfaction guaranteed on a money-back basis. Write today for FREE catalog.

## EASY TERMS

Midwest radios are sold only direct from the factory—not through stores or dealers.

**SEND FOR FREE 1939  
FACTORY CATALOG**

**MIDWEST *Factory-to-You* RADIOS**

DEPT. 59-GG MIDWEST RADIO CORPORATION...CINCINNATI, OHIO, U.S.A.

*Manufacturers of Quality Radios Since 1920*

**PASTE COUPON ON 1¢ POSTCARD... OR**

**MIDWEST RADIO  
CORPORATION**  
Dept. 59-GG Cincinnati, Ohio

Send me your new FREE catalog, complete details of your liberal 30-day FREE Trial Offer, factory-to-you wholesale prices, and big TRADE-IN Offer.

**Write Today!**

Name.....  
(PLEASE PRINT CLEARLY)

Address.....

Town..... State.....

User-Agents Make Easy Extra Money.  
Check Here ☐ for details





*Merry Christmas  
Everybody...*

*...and to everybody  
more smoking pleasure*

Chesterfield Cigarettes in their attractive Christmas cartons appeal to everyone. Their refreshing mildness and better taste give smokers everywhere more pleasure.

**Chesterfield** *They Satisfy*